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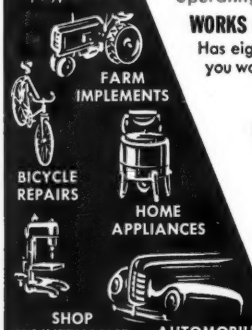

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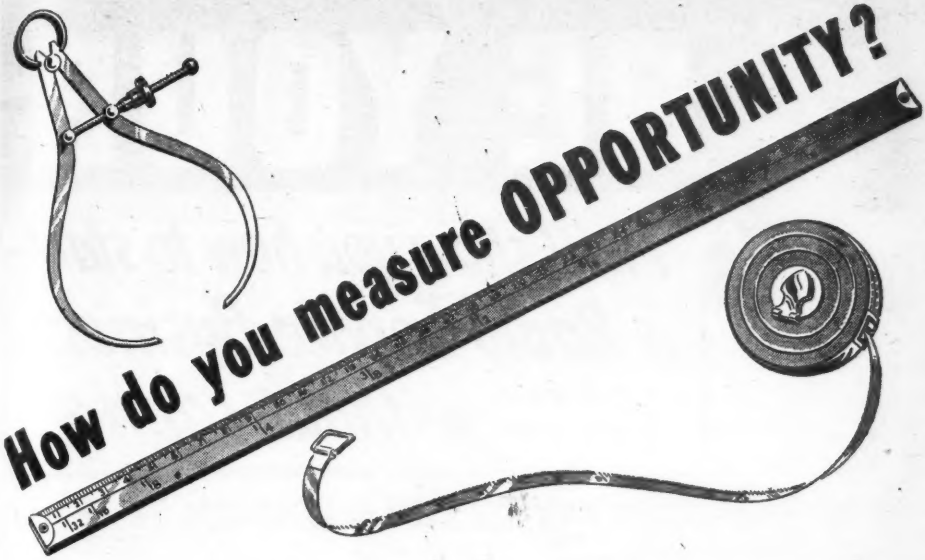

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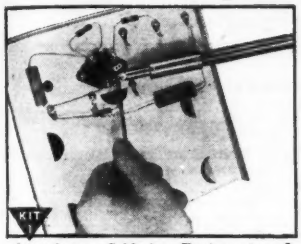
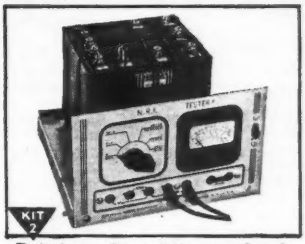
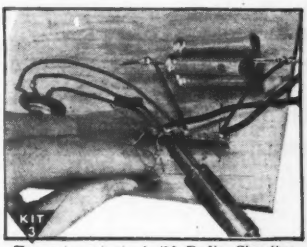


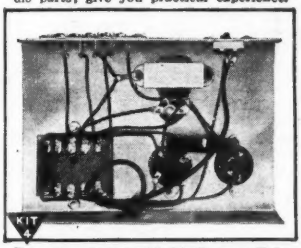
I send you Soldering Equipment and Radio Parts; show you how to do Radio soldering; how to mount and connect Radio parts; give you practical experience.



Early in my Course I show you how to build this N.R.I. Tester with parts I send. It soon helps you fix neighborhood Radios and earn EXTRA money in spare time.



You get parts to build Radio Circuits; then test them; see how they work; learn how to design special circuits; how to locate and repair circuit defects.



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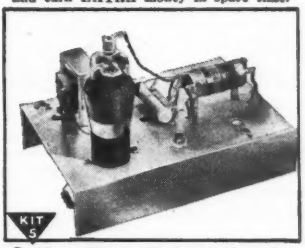

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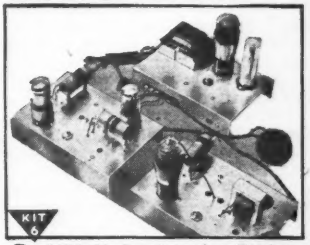

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OCTOBER, 1946 VOL. XXXVI No. 6

On the cover: *Auto-plane, color photo by C. Gunther—F.P.G.*

SPECIAL FEATURES

OUR SUPERSONIC AIR FORCE—*by Maj. Gen. Curtis LeMay* 41
Our planes will speed faster than sound

BELL'S XS-1—*by C. B. Colby* 45
Can this plane crack the supersonic barrier?

GOOD SHOOTERS ARE SAFE HUNTERS—*by Captain Jack Lacy* 47
You certainly don't want to kill anyone!

IS YOUR NEW CAR SAFE?—*by Tom McCahill* 52
Check the danger points in your new car

ENGLISH AUSTIN 55
MI's auto expert tests this new import

ATOMIC SUB VS. ATOMIC BOMB—*by Willy Ley* 56
Atomic fission will power—and arm—our subs

WINE FROM OUR WEST—*by Rosalind Lee* 60
California's grapes make mighty good wine

SUPERSONIC TESTER 63
Flaws are detected through ten feet of metal

PLANTING GUN 63
Here's a gun used to plant trees

DAVY JONES' CHOIR—*by Lester David* 64
Who'd have thought fish make such a racket!

HIGH-SPEED BAIL-OUT 66
These inventions allow escape at high speeds

PLANE-AUTO 67
Maybe you'll fly-drive this plane-auto

LION GROWS A WING 68
Coming this way—a 50-passenger flying wing

RADAR SPOOK 69
There's a ghost riding the radio waves

WHEEL AND COVERED WAGON 70
The life preserver was never like this

SCIENCE IN PICTURES 71

WILD-LIFE MINIATURIST—*by William A. Burns* 81
Tiny as the animals are, they seem alive

A LOOK AT YOUR NERVES—*by Donald G. Cooley* 86
Our nervous system is a bundle of miracles

ART ON METAL 90
Paintings can be made to live forever

PRIMPING THE PLASTER GALS 92
The pretty dummies have to be kept pretty

CIRCUS SOUNDOFF 94
Which creature makes the most noise?

SETTING PRETTIES 95
No wonder fine jewelry costs so much!

CRAFTS AND HOBBIES

CABINET MAKERS' CLAMPS 97

JIVIN' UP THE JEEP 98
From a battle car to a pleasure car

SNOOTIE 100
A Class A free-flight contest plane

PURSE RACK 105
A companion piece appears on page 142

TOOL DEGAUSSER 106
A demagnetizing unit to take the "stick" out of tools and parts

QUICK-CHANGE GEAR BOX 108
A 56-feed lathe attachment

AUDIO OSCILLATOR 112
For code practice and testing purposes

ORNAMENTAL BALANCE SCALE 114
A novel house plant holder

PLASTIC BASKET 115
Molded by hand

SMOKER'S BOOK TABLE 116
"At ease" with pipe and book

CAR CARE—*by Frederick C. Russell* 118
MI's M. D. (Motor Doctor) advises his patients

TIPS FOR THE HOME 120

NEW PRODUCTS 122

HANDY WALKIE 124
A shopping go-cart

BIKE FROM A TRIKE 126
A real two-wheeler built from a tricycle

BOATS AND BOATING—*by William F. Crosby* 128
This month: Practical advice on winter storing

SHOP SHORTS 130

CAKE SERVER 132
A project to please your wife

MI PLANS 133

MONTHLY PHOTO CONTEST 134

PORTRAITS IN GOLD 135
Miniatures with interchangeable backgrounds

BUYING A USED CAMERA? 136
Take a look before you buy

HOW TO USE FARMER'S REDUCER 138

QUESTION BOX 138

ARE YOU STEADY? 140
That is, when holding your camera

ROTARY TIE RACK 142
After you have built the Purse Rack on page 105, try your hand on this

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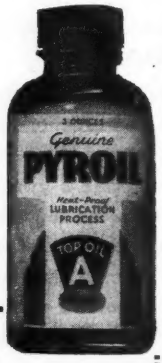

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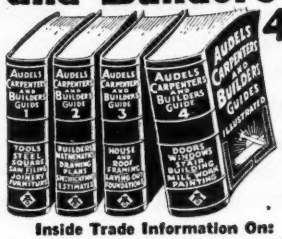

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The Rules of Practice of U. S. Patent Office advises—unless the inventor is qualified to handle such matters—that he employ the services of a competent Patent Attorney in the preparation of his Patent Application. We are Registered Patent Attorneys fully qualified to represent you at the Patent Office. Our long and varied experience in patent practice, we believe, enables us readily to understand inventors' disclosures, to advise what is probably patentable, after conducting preliminary patentability investigation of prior U. S. patents, and to draw your specifications and claims in such manner as to present clearly the novel features.

Patent Laws Favor the Inventor Who Acts Promptly

Remember, the details of your invention do not have to be 100% perfect before you can obtain patent. Unwise inventors often devote considerable unnecessary time working on unimportant details of their devices. This is expensive, hazardous and unnecessary. First step is to have us conduct search for the prior U.S. patents and render a report as to its patentability. Our Search Report is very valuable to you in that it clears up the course you should take in regard to your invention. If our Report is favorable, this report of the patentability of your device shows that your chances of patent protection are in your favor.

Have Patent Protection First

Unless you safeguard your invention by obtaining a patent, thereby securing a monopoly on same, it may become "public property," free to be made, used and sold by anyone, or it may be patented by some other person.

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Send me further particulars on how to protect my invention and "Invention Record" form at once. I understand that this request does not obligate me.

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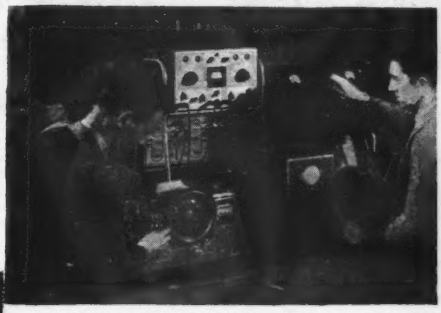

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Mr. Kraus has been giving advice to inventors for more than 20 years. He will attempt to answer as many letters from inventors as possible in his column each month. Mr. Kraus will "call his shots as he sees them" in this column. Thoroughly versed in inventions and inventions procedure, he will never, under any circumstances, disclose any valuable secrets. He cannot answer questions relating to patent law. For such information, the Editors suggest you communicate with any one of the patent attorneys who advertise in MECHANIX ILLUSTRATED.

Washing Machine

Robert W. Oswald, Madena, Pa., sends a diagram of a simple washing machine and wonders if it is an infringement on some other patent.

ANSWER: *Any patent attorney will give you the answer. It is extremely doubtful that there is any infringement here. The design appears similar to those which were in existence in the early eighteen hundreds, hence now are public property. By the same token, anyone else could make similar machines, and you also could get little protection, if any.*

Clothespin—Pencil Sharpener

Joseph O. Sackerson, Turlock, California, inquires about an organization to which he submitted an "invention" and also requests comment on a portable pencil sharpener.

ANSWER: *Actually, you have no invention. Merely substituting one material for the wood of the common clothespin does not, of itself, constitute an invention. Furthermore, not having a patent you really have nothing but an idea which you hope to sell and which a prospect would be foolish to try to buy because he cannot get any protection whatever in exchange for any monies he may offer.*

Similarly, and with equal force, these same statements apply to your portable pencil sharpener. You merely recommend that the standard models be carried in the hand instead of being attached to desk or wall. Many more portable devices were manufactured before 1941 and some will return to the market again. Some of these were the size of a clip and functioned as one when the sharpener was not in use.

Cast Iron Pipe Joint

Bob Catterson, Lincoln, Nebraska, sends a diagram of a method for sealing the joints of a cast iron pipe.

ANSWER: *In keeping with our policy, we are not disclosing the details of this method. The idea certainly sounds feasible, but we doubt that it is new. A search would reveal the true situation here. Your entire future action should rest with selection of the proper caulking materials. To prove their value would demand an expensive series of tests which you should be prepared to undertake.*

Handbag Frame

Alfred E. Johnson, Racine, Wisconsin, sends a drawing for a frame for a handbag. He wants an evaluation of the design.

ANSWER: *It is impossible to try to measure the value of a novelty of this sort. Assuming that you can demonstrate that the design is practical and does not smash or disarrange materials in the bag; assuming also that the outward appearance is in accordance with accepted woman's styles; and assuming that the construction would not cause undue wear; then, in our opinion, you have what should be a saleable article. We would suggest a search and careful investigation before you take further action which should follow if you are willing to take the gambling chance at interesting a manufacturer. We think that the ladies would be interested.*

Details of the design were not disclosed in this printed answer, in accordance with our established policy.

Shower Temperature Control

C. E. Ruse, Eugene, Oregon, states that he has invented a temperature control for shower baths which does not change the volume of water but just its temperature. He asks several questions concerning future action.

ANSWER: *A successful inventor should be able to design something which will fill a need, or do something better and simpler; who can promote the idea; and who should be able to manufacture and market if he can find no one else to do so. But while these are idealisms, it is not essential that all attributes be lodged in one person.*

There are many hundreds of manufacturers who are seeking new items. Assuming that your device is attachable to ordinary water systems and does not demand an auxiliary electric heater, then we would suggest further action.

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City..... *State*.....

Left: Mecca of sports fans and probably the best known public hall in the United States, Madison Square Garden, New York, will hold the National Crafts and Science Show the week of November 17.

National Crafts and Science Show

THE week of November 17 to 24, 1946, will be a busy and important one to hobbyists who live within convenient transportation distance of Madison Square Garden, New York . . . and that takes in a lot of territory these days. For eight interest-packed days the Exposition Hall of the famous Garden will be the scene of the First Annual National Crafts and Science Show, an event sponsored by MECHANIX ILLUSTRATED for the benefit of all people who engage in *active* hobbies.

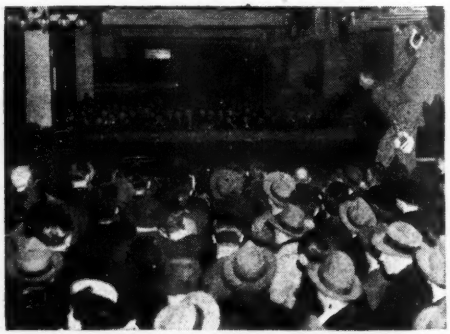
America's leading manufacturers in the home workshop, photography, amateur radio, boat building, model and crafts fields are combining their efforts to convert Madison Square Garden into a "hobby heaven" for the period of the show. They are spending many thousands of dollars on elaborate booths, and they expect to display publicly, for the first time, many new post-war developments that are just now going into production. These displays will be essentially dynamic in character; equipment will be demonstrated by factory experts who will be able to answer all of your questions. At many of the booths you will have the chance to use the tools and machines yourself.

The next issue of MECHANIX ILLUSTRATED will contain a floor plan of the show and a list of the exhibitors. No matter what your special interest is, you will find the whole show a grand spectacle. You'll undoubtedly "discover" new hobbies to supplement your current ones . . . and to make you spend your hardearned money!

MECHANIX ILLUSTRATED itself will run a special "Activities Area." This will take the form of an enclosed cage about thirty feet square in which model airplanes will be flown, midget racing cars run, and model boats floated. Many of the events to be staged in this area probably will be televised. The demonstrations of control-line model planes will be especially spectacular.

With high-intensity lighting throughout, the show will definitely be photogenic. You'll want to "shoot" many of the activities, so bring your camera and lots of film.

The National Crafts and Science Show is under the management of Campbell-Fairbanks Expositions, Inc., 139 East 47th Street, New York, N. Y. Secretaries of model, camera, radio, railroad, boat and crafts clubs are invited to write to this firm for information regarding a time-saving plan in connection with the purchase of tickets in blocks.



This scene is from the Sportsman's Show, taken in Madison Square Garden during February of 1946, and is shown to give an idea of the size and capacity of the Exposition Hall, where the National Crafts and Science Show will be held.

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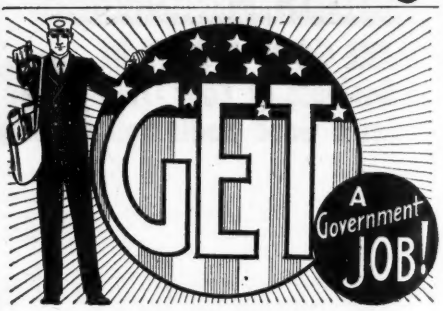

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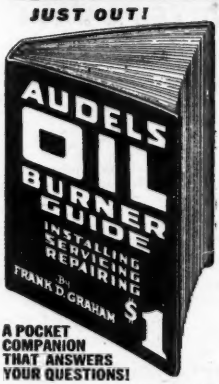

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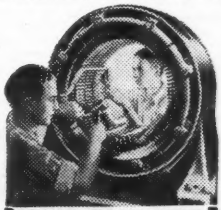

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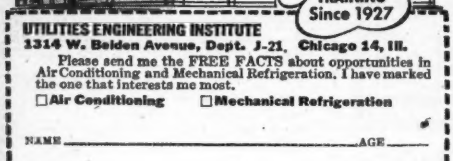

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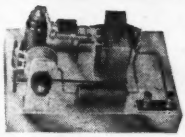

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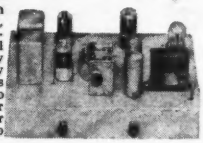

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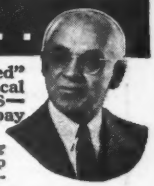

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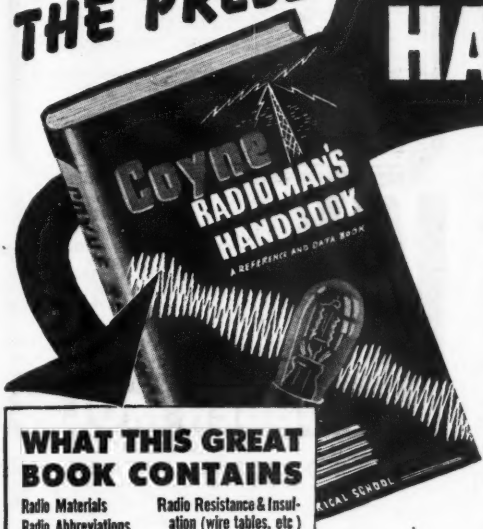

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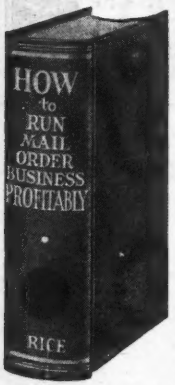

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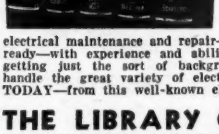

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The P-84 may break through the sonic barrier. If it does, there's no speed limit!

our Supersonic air force

BY MAJOR GENERAL CURTIS LeMAY
Deputy Chief of Air Staff for Research and Development

Will warplanes flying faster than sound protect our shores from future atomic aggression?

TWICE as fast as sound! That will be the speed of our supersonic air force of tomorrow.

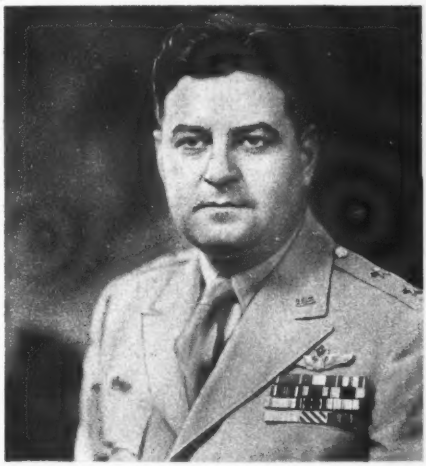
The warbirds will come silently at 1,500 miles an hour. Sound will be left behind.

They'll come without vibration. Their jet and rocket motors will have no moving parts.

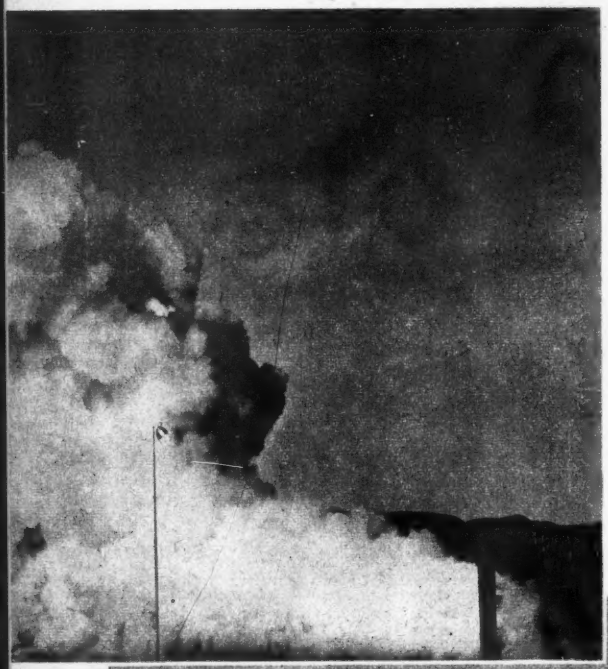
The pilot will be safe. He will breathe pure oxygen. He will wear a pressure suit and probably a pressure helmet. His cockpit will be pressurized.

If the plane reaches an altitude of 80,000 feet, the outside temperature will be 67 degrees below zero—but the pilot won't need cabin heat. The thin air on

General LeMay, former CO of the 21st Bomber Command, made an outstanding war record as an expert on strategic bombing. In 1944 he was the youngest major general in the Army.



The cross section shows the extremely simple construction of the Navy's ramjet. Nothing moves but the fuel.

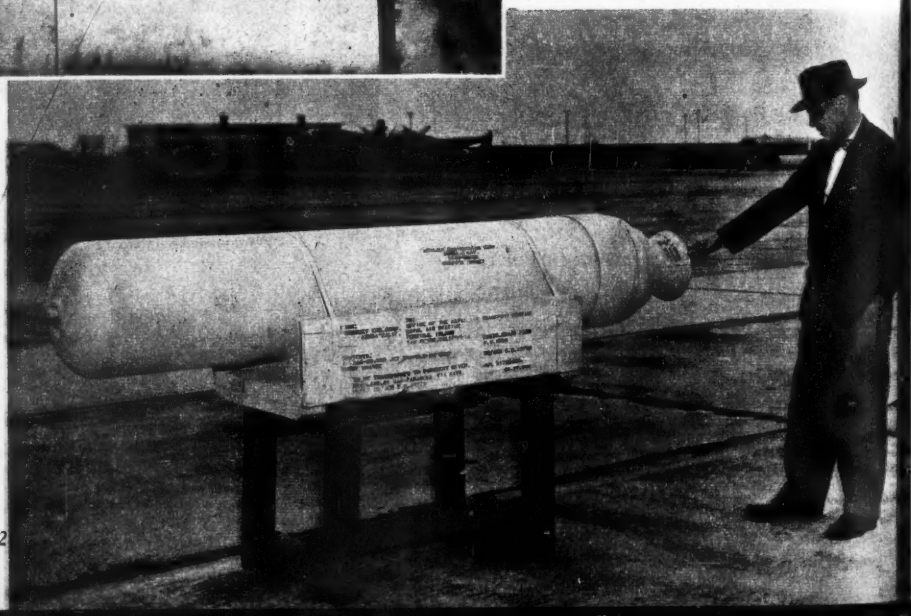


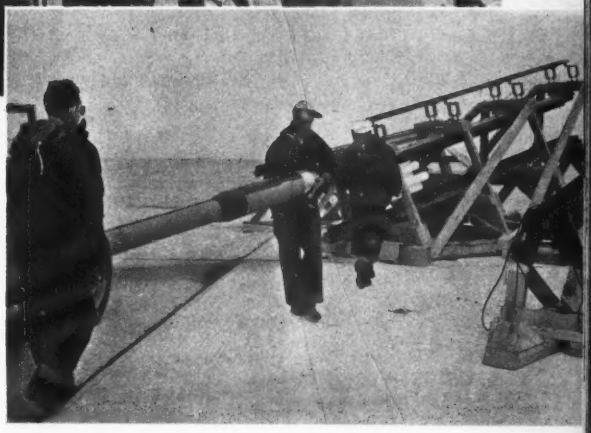
the skin of his plane will generate terrific frictional heat at sonic speeds. High temperatures are found even today in the cockpit of a P-80 at speeds well below the sonic range. At 1,500 mph the cabin temperature will tend to increase as much as 400 degrees. Actually, the pilot will need insulation or refrigeration.

What will happen if the high-flying plane become disabled? The pilot need not worry. He'll be automatically ejected from his aircraft, along with part of the cabin. At the proper altitude he will be freed from the cabin and will fall as a free body until he reaches a safe altitude. There, again automatically, his special parachute will open, allowing him to reach the ground safely.

Does this sound fantastic? Let me point to several new developments. The Air Forces' newest jet fighter, the Republic XP-84 Thunderjet, already thoroughly flight-tested, has a speed exceeding 590 mph, a

Moby Dick looks innocent enough when he's not hot up, but when fired as at left he kicks up a 30-ton thrust.





The ramjet "flying stovepipe" is expected to exceed 1500 mph—but can it push a plane beyond the sonic barrier?

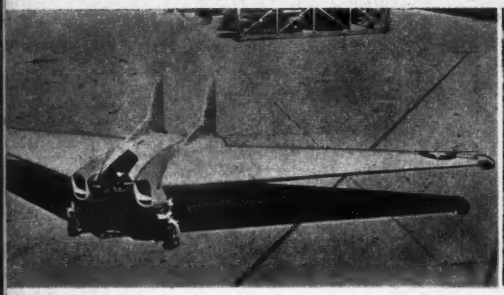
service range of 1,000 miles and a service ceiling of over 40,000 feet. It is about the same size as the Lockheed P-80, but it weighs 9,000 pounds—1,000 more. The chief design difference is that the XP-84 air-scoop is in the nose of the plane instead of on the side.

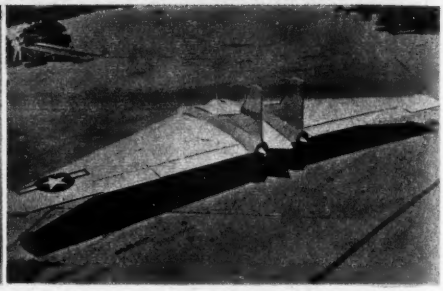
The Thunderjet, more than 100 of which will be produced within nine months, has a tricycle landing gear and a G. E. TG-180 axial-flow jet engine. Its other features include: a jettisonable bubble canopy, electrically operated, which allows the pilot to open the canopy at all air speeds and jettison it prior to emergency exit; a specially-built pilot ejector seat to provide emergency exit at high speeds; an air conditioned, pressure cabin to relieve pilot fatigue; and provisions for carrying wing-tip-mounted external fuel tanks to obtain maximum range with minimum increase in drag. The rear section of the fuselage is quickly removable to allow complete engine replacement in 50 minutes.

Another newcomer specially designed to smash the sonic barrier is the XS-1, which can be attached to a big bomber and taken to high altitudes for release. Its exact construction and performance features are withheld, but certain characteristics may now be sketched.

The XS-1 will be rocket-powered. Today, strictly speaking, it is not a military plane but a flying laboratory. This ship already has been flown but not at sonic speeds and not under its own power. It has passed all its preliminary tests and has been allowed to dive and glide. Test pilots know its stalling speeds, control corrections and landing techniques, and it is now ready for the first test flight under its own power.

Another new plane is a single-place flying wing fighter known as the XP-79-B, built by Northrop. This is a jet-propelled ship capable of attaining speeds exceed-





The pilot lies down on the job—in the horizontal cockpit of the little "flying ram."

ing 500 mph. A distinctive feature is that the pilot flies the aircraft while in a prone position. The XP-79-B is an all-metal, pressurized flying wing powered by two Westinghouse model 19B jet units. Twin fins are mounted on top of the wing, and rudder-assist ducts aid in operating split-flap rudders at the wing tips.

No doubt you've heard rumors about a new type high-altitude high-speed jet engine known as the ramjet. This engine can operate faster and higher than any other aerial power plant, with the one exception of the rocket-engine.

The ramjet is the ultimate in simplicity. Apart from the fuel system, the engine has no moving parts and thus no lubrication system. The ramjet works like any internal combustion engine. There is, first, intake and compression of air; second, combustion or heat release; third, expansion of air or power stroke; and fourth, exhaust.

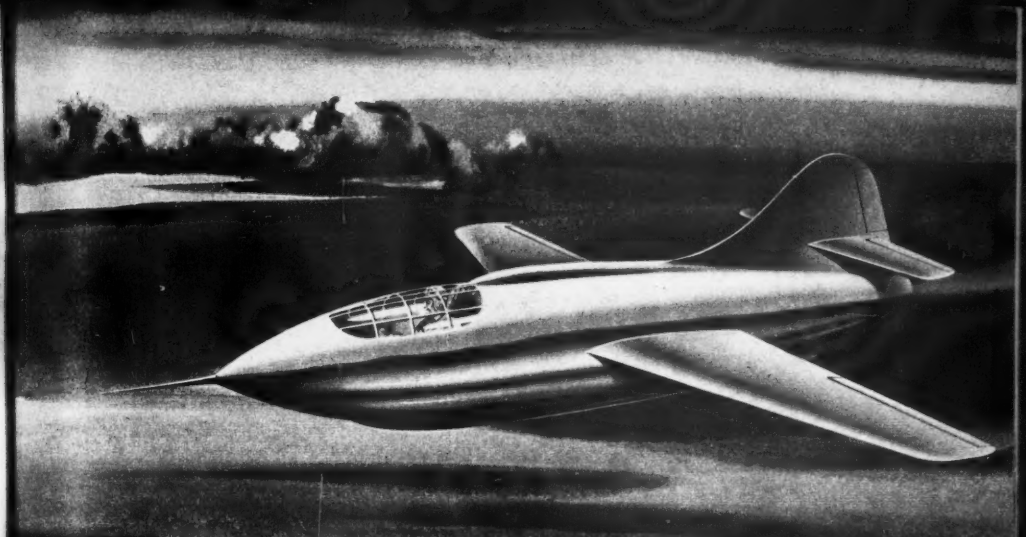
Performance figures indicate high potentialities for the ramjet engine. An ordinary aircraft engine driving a propeller burns half a pound of fuel per thrust-horsepower-hour. Fuel rates and output for supersonic flight are enormous. But the ramjet seems to be the most suitable engine for attaining speeds in excess of 1,500 miles per hour at altitudes beyond the maximum for present aircraft.

Already the ramjet has been flight-tested on existing Air Forces' planes and projects for larger and higher-speed engines of this type are under way. The rocket is the ramjet's chief competitor for high speeds. The ramjet requires about one-sixth as much fuel, as the rocket carries its own oxygen; but at extreme heights ramjets aren't effective yet due to lack of oxygen.

Potentialities of the ramjet lie in three fields. First, its greatest suitability seems to be for supersonic aircraft, piloted or pilotless. Second, because of its light weight and ease of fabrication, it may be used for subsonic, expendable missiles.

The third possibility is to use it for rotary wing aircraft where rotor tip speeds may approach the speeds desired for ramjet operation, and where the economy of engine weight and freedom from power transmission problems compensate for a higher fuel economy.

The model plane Colonel Dane is holding is that of a V-2 rocket, with airfoils replacing the warhead.



Bell's XS-1

Can the supersonic XS-1 pass the mysterious barrier which bars flight beyond the speed of sound?

BY C. B. COLBY

FLYING today's experimental aircraft, according to Jack Woolams, Chief Test Pilot for Bell Aircraft Corp., is "like carrying a million dollars' worth of eggs down an icy street!"

He should know, for he is about to carry one of the most expensive eggs down aviation's iciest street—the street passing through the sonic range of high-speed flying.

To navigate this slippery road has long been the ambition and goal of aeronautical engineers and physicists. The most slippery spot is around 760 mph, the speed of sound at sea level. Once beyond that spot it is believed that there is almost no limit to what aircraft can do with sufficient power.

Aircraft runs into difficulty when the trans-sonic range is approached. Propeller-driven aircraft do not have the power required to push the airframes through the turbulence encountered when approaching this area of compressibility. Years ago a German ballistics expert named Mach (pronounced Mock) set up a system of speed measurements based upon the speed of sound, 760 mph, using that speed as "1." on his scale. Below that, speeds are indicated in decimals. For example, .5 is a speed of 380 mph while a speed of 2. is 1,520 mph. A speed of 1. is the critical spot that Jack hopes to negotiate with his "million dollar egg," the Bell XS-1 (XS for Supersonic).

Until this trans-sonic range in the speed scale has been passed, future aircraft design is stymied for lack of knowledge as to the sort of design required. In rockets and jets we have the power to pass this barrier, but heretofore we have not had the airframe.

We have the airframe now. The Bell XS-1, sonic research aircraft, is the key that Jack Woolams will use in an effort to unlock the door to all future high-speed flying. So far, our best speed has been 606 mph, or .85 Mach number. But, built on Army contract for the National Advisory Committee for Aeronautics, who did the wind-tunnel testing of the quarter-scale model at their Langley Field tun-

A B-29 carries the XS-1 aloft in its bomb bay and releases it slightly tail down. Right, the supersonic pilot, Jack Woolams.

nels, this aircraft, to use the words of Robert M. Stanley, Chief Engineer at Bell, is to see if "an orthodox aircraft with enough power" can break through the sonic wall at Mach 1.

The Bell XS-1 is an orthodox aircraft in that it has a standard airfoil, normal tail assembly, cockpit, tricycle landing gear and fuselage. Beyond this, in detail and power plant, it is unorthodox. Much has been written on what a supersonic (faster than the speed of sound) aircraft will look like, but it has all been based on theory and what the engineers *think*. The Bell XS-1 is based upon what the engineers *know*. Certain innovations have been included in the design of the XS-1, but they have mostly been necessary for the safety of the pilot and the return of the aircraft.

Inasmuch as the XS-1 is a research aircraft, its safe return is a must. Much of its flight data is transmitted via telemeters to engineers on the ground, for permanent records—but without the human pilot the test flights would produce little but limited mechanical information. High-speed, high-altitude rockets have been sent aloft many times, but until a human pilot rides a rocket through the stratosphere at a high Mach number we cannot know completely what goes on aboard the aircraft and in the human mind in this new realm of flight.

Looking at [*Continued on page* 79]

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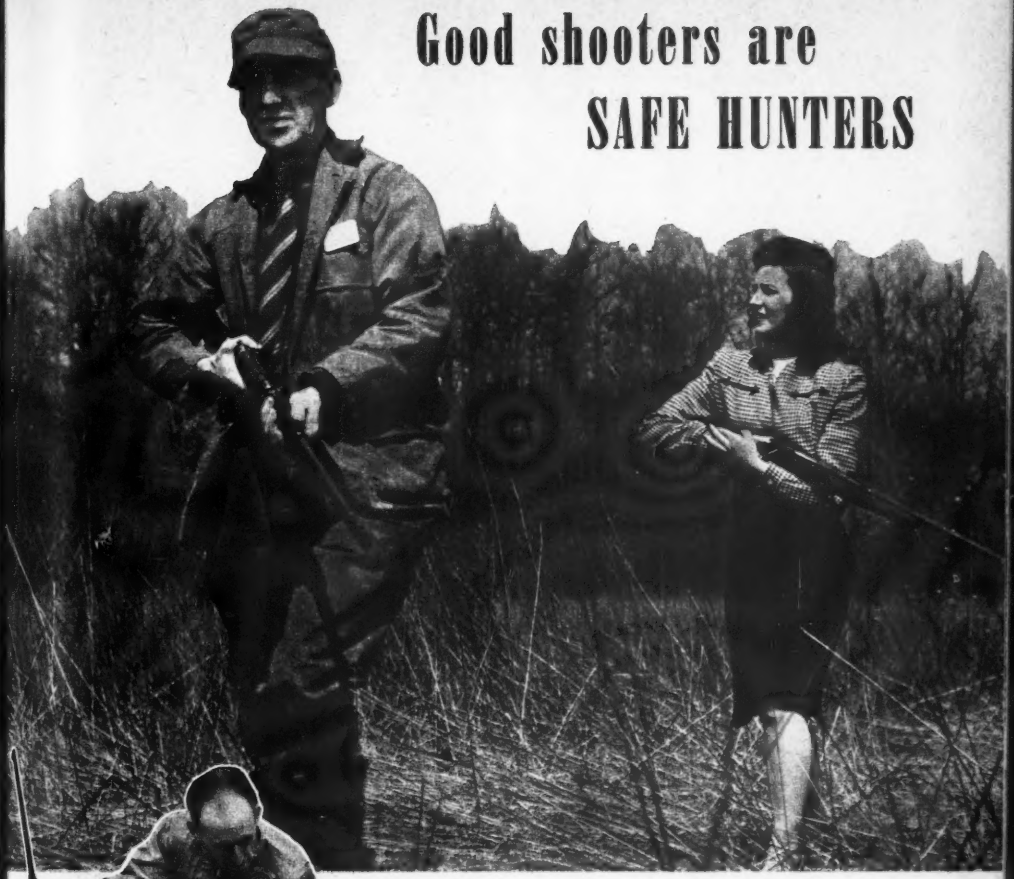


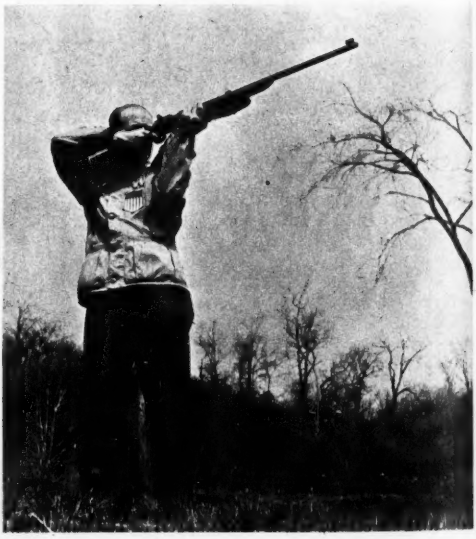
Take a few hints from this rifle expert and don't shoot yourself—or anyone else.

BY CAPTAIN JACK LACY
Rifle expert, Winchester Repeating Arms Company

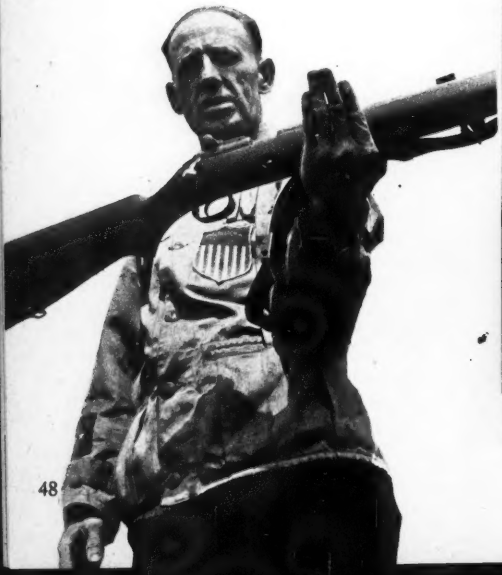
THIS fall is expected to release the greatest accumulation of pent-up interest in hunting ever known in this country.

America is one of the few nations in which the average person can still exercise his privilege to hunt, and the average shooter can take a bow for his observation of safety, which has made hunting the second safest of our sports.

Top left, Capt. Lacy uses "sight diagrams" to show what the eye sees in proper aiming. Other photos above illustrate the correct relaxed prone position when "on the target."



Capt. Lacy finds the balance of a Model 52 and demonstrates the correct offhand shooting position.



WRONG The trigger cannot be properly squeezed by the finger tip. Contact should be at the sensitive first (or second) joint. **RIGHT**

WRONG The rifle butt should never rest on the arm muscles. Nestle it in the hollow of the shoulder, your cheek against the stock. **RIGHT**

WRONG Never carry the rifle through a fence. Open its action, lay it through, then cross yourself, several paces away. **RIGHT**

Don't rest the rifle muzzle on the ground; earth in the barrel may cause it to blow up on the next shot. And why risk putting a hole in your foot?

Below, Capt. Lacy, holder of eight national championships, shoots from the sitting position. Note that the actual position of the rifle is unchanged.

Shooting is not something you can put on like a shooting coat. It is something which must be practiced so consistently that it becomes second nature. Right now when millions of men and women throughout the country are preparing to take to the hunting field with rifle and shotgun is a good time to review the "musts" of safety.

Rules are seldom exciting to read, but since great trouble may follow their violation, I have always insisted that the thousands of persons I have taught to shoot know these so-called Ten Commandments of Safety:

1. Treat every gun with the respect due a loaded gun. This is the cardinal rule of gun safety.
2. Carry only empty guns, taken down or with the action open, into your automobile, camp, and home.
3. Always be sure that the barrel and action are clear of obstructions.
4. Always carry your gun so that you can control the direction of the muzzle even if you stumble.
5. Be sure of your target before you pull the trigger.
6. Never point a gun at anything you do not want to shoot.
7. Never leave your gun unattended unless you unload it first.
8. Never climb a tree or a fence with a loaded gun.
9. Never shoot at a flat, hard surface or the surface of water.
10. Do not mix gunpowder and alcohol.

One way to become a murderer! Always point rifle at ground when loading it.

A wooden "sighting bar" rather than a rifle should be the beginner's first gun. Simulating a rifle barrel and target, this four-foot bar teaches him to align his sights and center the bull's eye so it appears to rest lightly on the top of the front sight.

The beginner's first rifle should be a .22 caliber. Our military services have long used this "small bore" arm for instruction purposes before graduating troops to the standard caliber .30 rifle.

It is military practice for riflemen to use a sling in shooting in the standing, prone, kneeling or sitting positions, but sportsmen seldom use a sling. During instruction, however, a sling is mandatory. Its purpose is to steady the shooter by virtually joining him with his rifle.

Prone shooting, most popular with competitive shooters, is the most relaxing of all positions and best enables the novice to acquire such fundamentals as the proper [*Continued on page* 155]

One way to commit suicide! Light up, but first unload your rifle and lay it safe on the ground.

Is Your New Car Safe?

BY TOM McCAHILL

All '46 cars have their bugs, says MI's auto expert. Here's what to watch for and check.

EVEN in normal times the chances of buying a new car that will be trouble free for the first 5,000 miles are about one in a thousand. You can usually feel just as certain as the sun will rise tomorrow that a number of little things will go wrong that will have to be serviced. It may be just a light bulb or a loose battery connection or a leaky tire valve but, some little annoyance is almost certain to occur. This fact is one of the prime reasons for your service guarantee when buying a new automobile.

The dealer knows that you will be back because this or that doesn't work as it should and when you bought your new car the price for this service was included in the original purchase contract. Unfortunately, up to now I have been referring strictly to normal times. Today, times are far from normal.

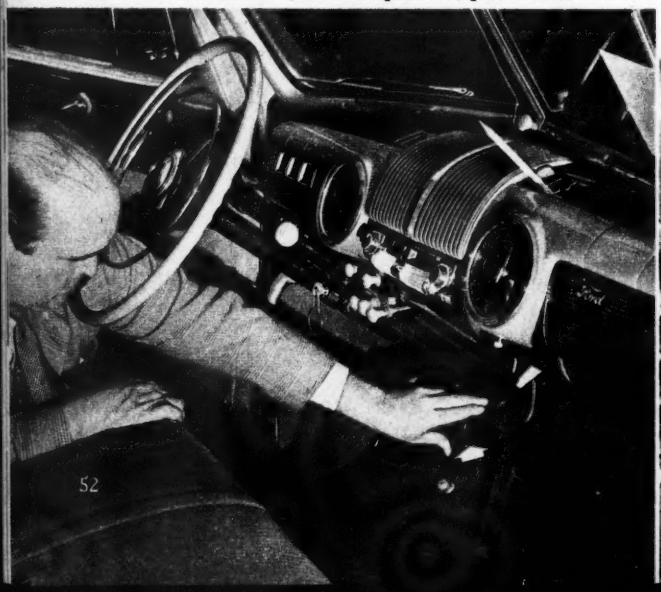
Manufacturers have many problems facing them that never existed in the past. Labor in the final assembly is vastly inferior in all factories to what it was before the war. Slipshod attitudes prevail in many shops, because the factories have been forced to hire inexperienced help, due to the still existing lack of skilled labor. However, this is not being written to discuss the labor situation but to put you on guard against brand new dangers that are now commonplace—not only financially but to life and limb—when you find yourself in possession of a shiny, new automobile.

The quality of the material going into the new cars is, with a few exceptions, the same as before the war. Where the trouble appears to lie is in how this material is assembled.

Recently I interviewed a top flight au-

Troubles apply to all new cars alike. McCahill uses this borrowed Ford only to demonstrate his points.

Brakes are your neck's No. 1 safeguard. If the pedal goes on in after 30 seconds' pressure, hydraulic system leaks.



tomotive man and close personal friend who had just returned from a nation wide tour in a 1946 car. He had experienced the following breakdowns, fortunately within his guarantee, so no financial loss was involved, except time.

First, the speedometer went bad because someone assembling the instrument had forgotten to lubricate it. Next, the starting motor failed because the switch was incorrectly assembled. With 500 miles on the speedometer he began a coast-to-coast run with the following things happening in succession: the oil filter gasket worked loose and only by the greatest of luck it was discovered before his engine was ruined. When he had his oil checked in a gas station, the attendant told him the crankcase was empty. I call this luck because less than 70 miles before, he had had it checked and it was full. He wouldn't have had it checked again, he told me, except that he unconsciously pulled the hood release when he stopped for a tire check. Next, the generator bearing burned out because it had been assembled out of line to start with. After that he found the water pump pulley weaving like wheat in a breeze because that bearing had gone.

After all this he decided to give the car a thorough going over from stem to stern and found the battery case cracked. Being still on guarantee, it was replaced. It was at this point that he decided as long as he was going to have trouble, he might as

It's night on the Mojave desert. You've got a flat. You open your new tool kit and everything's there but a jack. It happened to Tom!

One unlucky owner's pride and joy burned out its rear end after loose bolts allowed all the grease to leak out. Guarantee covered him.

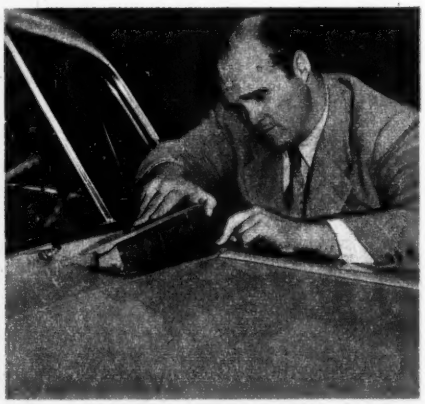
well have it before his guarantee ran out which was four months or 4,000 miles, which ever occurred first. From then on, he pushed the car for all it was worth by cruising across Texas, New Mexico and Arizona, hour after hour, doing seldom less than 70 and usually 75.

Before reaching California from New York he had to have another generator installed and another water pump, both these replacements having gone bad. Then the clutch went sour and had to be fixed which was the last trouble he had within the guarantee. By that time he thought all the bugs were out, so he stopped pushing.

With one exception he was right, that exception occurring when by a stroke of luck he avoided burning up his rear end. He had just finished a run of several hundred miles at high speeds in Texas and pulled in for a grease job. As soon as the car was raised on the lift, grease spatterings were noticed all over the rear tires, housing and gas tank. On pulling the rear axle plug there wasn't a sign of grease. The gear housing was bone dry.

What had happened was that the bolts that hold the cover on the rear housing had worked loose and under the pressure built up by the gears turning at high speeds all grease was forced out. He was just plain lucky. Another owner I interviewed told me his new car's rear end actually did burn out when the same thing occurred. [*Continued on page* 157]

McCahill put the bee on 52 new car owners in 17 different states—51 had had troubles of some kind. Here he inspects the front end.



Sleuthful Tom doesn't want his feet to get wet some rainy night. A leak in the vent gasket might make the instruments all wet, too.

ENGLISH AUSTIN

Tom McCahill, MI's auto expert, couldn't resist testing this new import.

A small car, but outstanding in its roominess, comfort and gas economy.

THE postwar English Austin has invaded this country and you can buy one for 1590 dollars.

The job is called the 4-cylinder Austin "8"—the "8" denoting its horsepower—and it's not to be confused with the American Austin of mechanical-roller-skate size, though it is a small car by our standards.

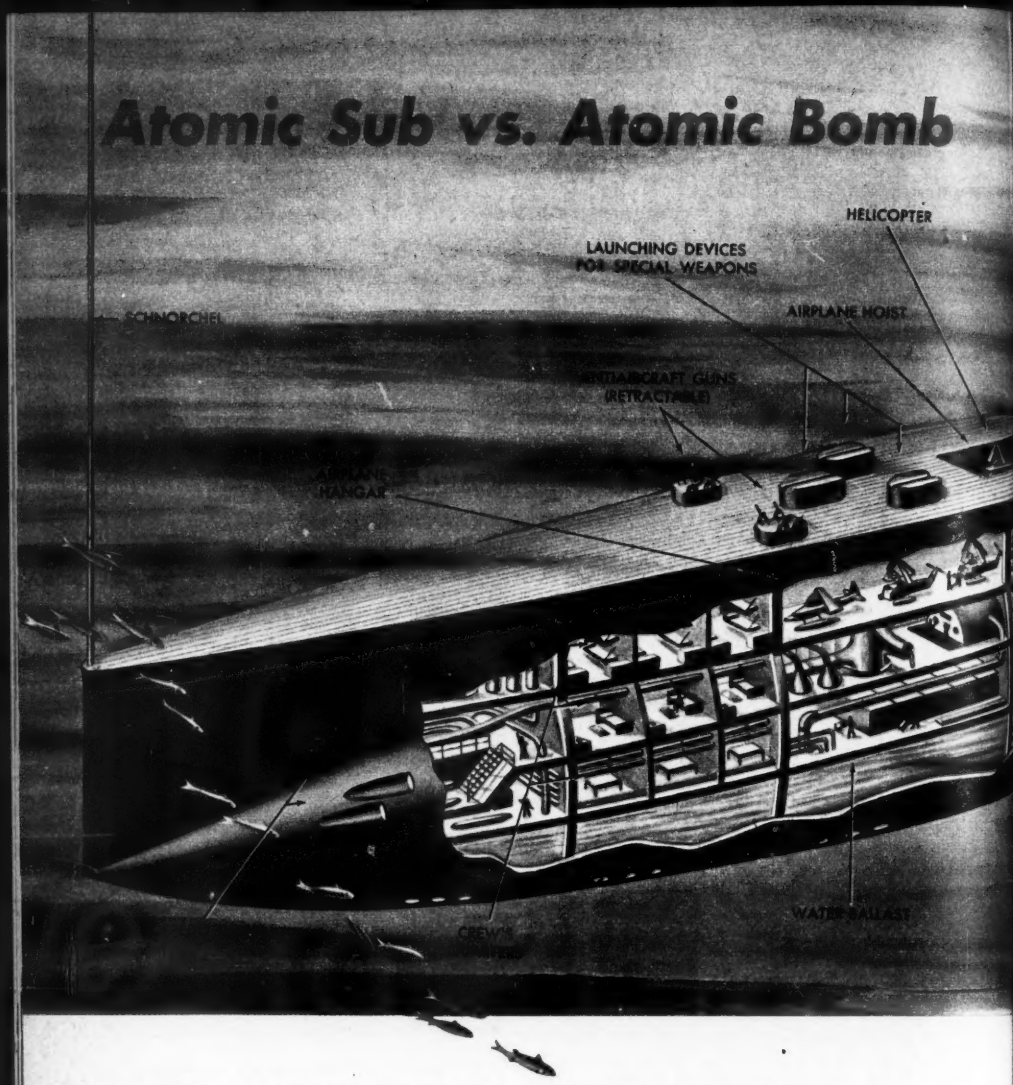
I took one of the new arrivals on a long test run right after it was unloaded from the Queen Mary and was amazed at the roominess and comfort it afforded. American manufacturers would do well to study the English planning of interiors. The front seats are of roller type, like a rowing seat, and when fully back allow more leg space than any American car I have ever sat in. The interior finish and seats are made of soft leather in keeping with the best English standards—always a jump or so ahead of ours in detailed appointments. There is a roomy trunk for tire and luggage stowing and a retractable leather arm rest between the rear seats. The car I tested had a right-hand drive, but I was told that left-hand drives would be on the way shortly.

The price of the new Austin puts it in a specialty class because—in my opinion—we made many cars before the war which sold for much less and were far better cars, from a performance and engineering standpoint.

The Austin [*Continued on page* 159]

Of course, the more room the driver takes, the less there is for those behind. Under the alligator hood lies a compact assembly.

Atomic Sub vs. Atomic Bomb



IF THERE ever should be a "next" war, perhaps not a ripple will disturb the surface of the surrounding water as the zero hour approaches—but underneath, like a school of barracuda, a fleet of atom-powered submarines will streak toward their objective. Moving at possible submerged speeds of sixty or seventy miles an hour will be huge troop carriers, aircraft carriers, mobile weapon units, artillery carriers and even fully equipped hospital submarines.

This is quite possible. Although the atom bomb may not drive the surface craft from the seas it will probably result in the development of the submarine to a degree heretofore unimagined.

Of all the vessels comprising a modern navy, the submarine is least likely to be influenced in its design by the atomic bomb. At the same time, it is the type of vessel which is most likely to be influenced by atomic energy as a means of propulsion.

It is clear that the military minds of the United States are definitely interested in the application of atomic energy, not only to destructive explosions but also to the problem of "getting there fastest with the mostest."

Our subs will be atom-powered, and deadly with planes, guided missiles and atomic bombs.

BY WILLY LEY

When the Bikini tests have been fully evaluated we'll know more about their influence on naval design. But it would seem that of all the types of naval unit, the submarine is least vulnerable to atomic bombs. This is so because in order to hit a target you must "see" it, by actual vision or by radar. The submarine, with its ability to steal along under the surface of the water, is much harder to pick up, even with scouting aircraft, radar or sound detectors.

The submarine, as a war device, has the very powerful element of surprise. A convoy sails serenely along, guarded by its naval escort. Everything seems secure, when suddenly torpedoes explode, blowing transports and merchant ships sky high. The very shock of sudden attack has a demoralizing effect.

The first under-water attack by submarine was made just about 170 years ago by Sgt. Ezra Lee in New York Harbor, off Governor's Island. The machine was propelled through the chilly waters of the harbor by the muscles of its one-man crew, the aforesaid Sgt. Lee. The only source of air was that contained within the body of the vessel, about enough to last for twenty minutes. You can under-

stand that the sergeant had to work fast!

Robert Fulton built a submarine, the *Nautilus,* and tried her out in the river Seine in France. His submersible was very much like the revolutionary sergeant's. So was the only Confederate submarine which saw action in the Civil War. In this, eight men cranked a drive shaft, for power. More advanced models built by Wilhelm Bauer—one the first Prussian, and the other the first Russian, submarine—were driven by treadmills.

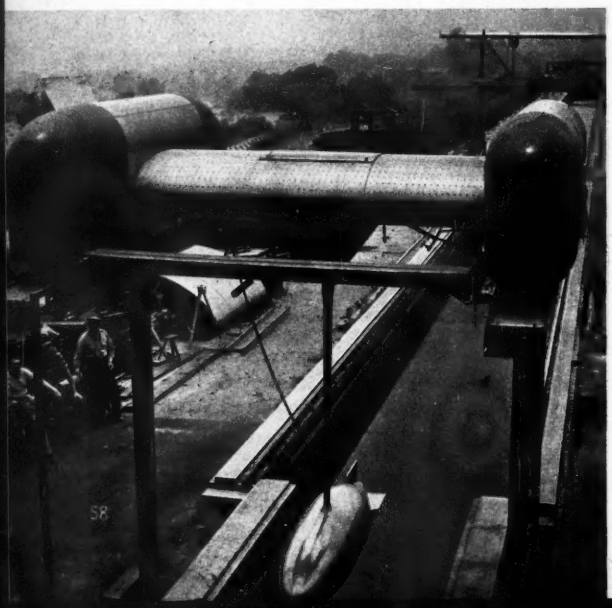
The modern submarine is only half a century old, being based on the *Holland.* Its inventor realized that muscle power was not enough. Other inventors had realized that, but they had not been able to find a suitable engine. Holland knew that there must be two engines—one each for propulsion on the surface and under water. For under-water travel only electric motors were feasible since they do not consume oxygen.

As the submarine grew in size the internal combustion engines made way for more powerful Diesels, but the two-engine system remained.

The displacement of the *Holland* was 74 tons, that of the German submarines of the first World War around 300 tons. The second World War brought out submarines of various sizes, depending on the type of operation for which they were designed: one of about 250 tons, another of about 1,500 tons, a third a little over 2,000 tons. For a long time the French *Surcouf,* built in 1929, was the largest submarine in existence. It displaced 2,880 tons at the surface, was 361 feet long, carried two 8-inch guns, two 37-mm. antiaircraft guns, several machine guns, ten torpedo tubes and a small seaplane. Late in the war the Japanese produced still bigger monsters with their I-400 class, displacing 4,660 tons, carrying three bombers and having a cruising range of 34,000 miles.

All through the war there were persistent rumors about a German submarine with Diesels which ran on hydrogen so that no batteries or electric motors for under-water cruising were needed. None of these rumors was true. What the Germans had developed was a device called the *Schnorchel,* a kind of breathing tube that permitted them to exchange their air and to re-charge their batteries while staying submerged at periscope depth. One of these boats is said to have stayed under for seventy days.

A composite picture of the most modern submarine that could be built today stacks up as follows: it could be of any size up to about 5,000 tons' displacement (of course nobody would want *only* large submarines). It could more than likely dive about 400 feet and if left undisturbed could stay submerged at such shallow



JET TORPEDO

THE hydrobomb, a torpedo to be launched from a fast bombing plane and jet-propelled under water at high speed, is undergoing simulated launching tests at the Jet Propulsion Laboratory of the California Institute of Technology (see photo, left).

It is about 10 feet long and 28 inches in diameter. It is designed to travel under water at 70 mph, driven by a solid-propellant rocket unit delivering 2,200-pound thrust for 30 seconds.

Mechanix Illustrated

Launched under the surface, guided missiles will unerringly find their targets.

depth for about three months by means of its breathing tube.

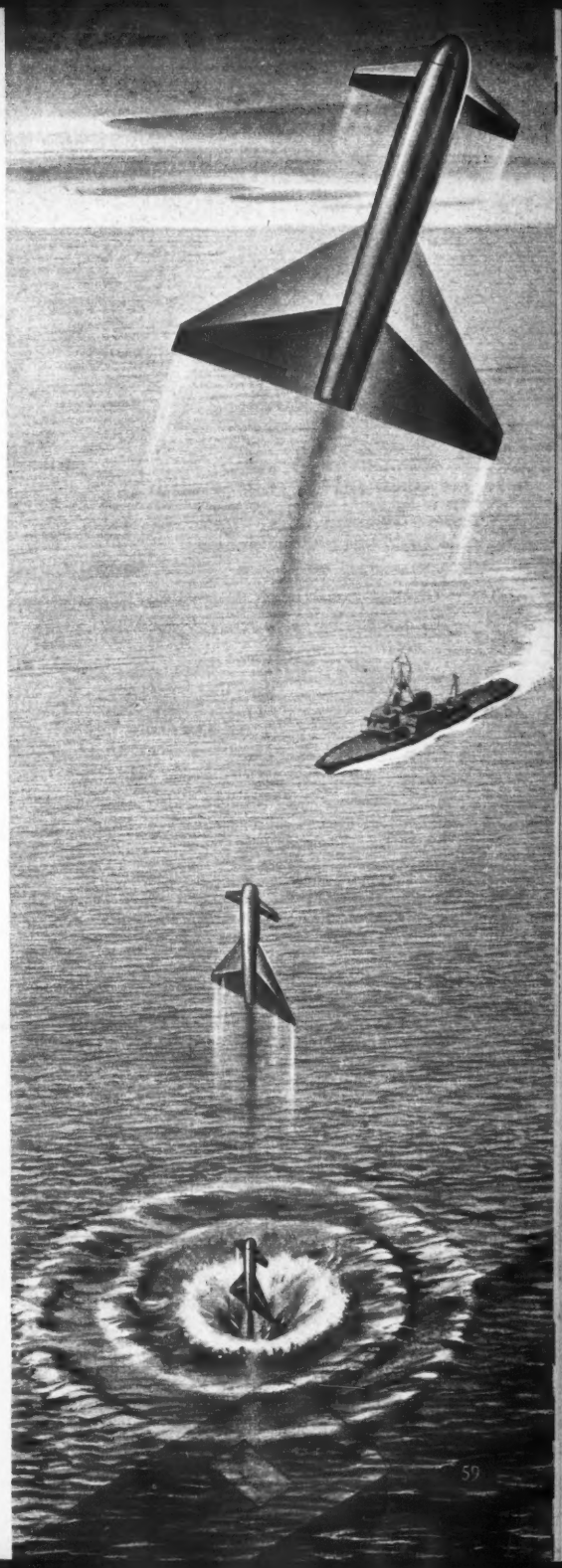
Its armament could consist of some 12 torpedo tubes and about eight 90-mm. dual-purpose guns as well as smaller weapons. And it could be fitted with a device for launching robot bombs of the V-1 type when on the surface. But it would have a large number of the usual weaknesses of all submarines. Physically, it could take less than half of the punishment that would cripple a destroyer. Only a little damage would force it to the surface. Its storage batteries would still have as much as one-sixth its total weight. And while its surface speed, powered by powerful Diesels, might be 22 knots, its cruising speed, submerged, could be only half that much.

As long as dual power plants are necessary to the submarine, no basic changes in design can take place. Basic change can be brought about only by an entirely new invention —and atomic energy looks like that new "invention."

It will not be necessary to use highly refined, almost pure U-235. Ordinary uranium, only slightly enriched with U-235, reacting in a pile, will suffice.

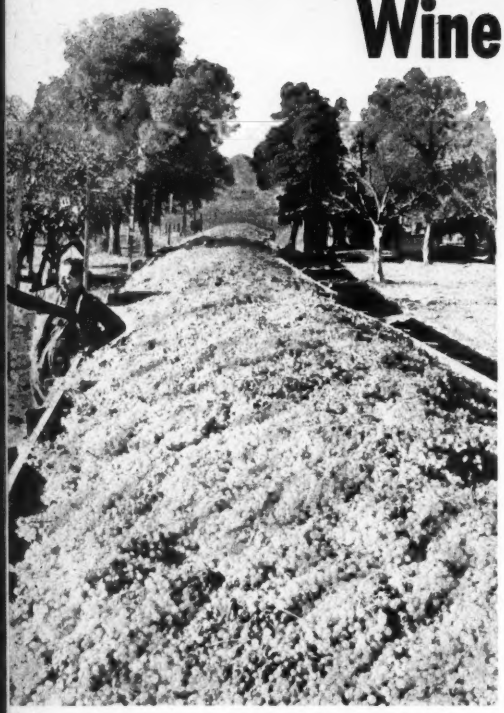
Naturally, plutonium would be produced in such a pile but this time the plutonium would be the by-product and the heat the main object. It has not been made known whether a pile can be operated at such a temperature that it produces high-temperature steam directly. If it can, the steam would drive the turbine of the submarine. If it can't, boiling water from the pile could be used to heat a liquid of a lower boiling point. Just what the details of steam production would be is up to the designers, but the pile looks promising.

Since no oxygen is used up, the operation of the uranium pile can go on [*Continued on page* 159]



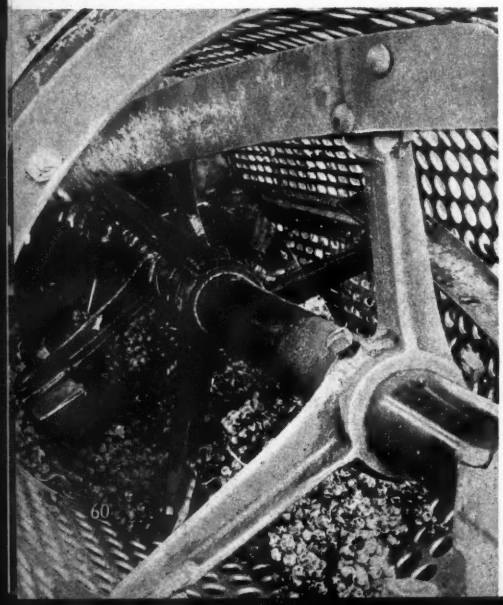
Wine from Our West

BY ROSALIND LEE



Trainloads of grapes, endless rivers of them, luscious, beautiful, freshly picked, arrive at the wineries on their way to the bottle.

An interior view of a modern crusher which delicately separates the grapes from their stems, then crushes them, freeing the juice.



CALIFORNIA'S vines have tender grapes.

And year by year they have more and more of them.

California's grape crop now ranks first among her farm products, way ahead of oranges, in second place. Her modern wineries turn out 90 percent of the wine produced in this country, and her half million acres of vineyards grow 125 principal varieties of grapes.

Her grapes make good wine. The soil and climate of California are similar to those of the best of Europe's vineyards and the traditional wine grapes of the Old World thrive in them, giving wines that are closely similar.

The great Gausti vineyard of 5,000 acres, famous as the world's largest, lies in the fertile Cucamonga Valley of Southern California and provides an imposing example of large-scale production and modern methods of supplementing the ancient processes.

A new mehanical loader developed there loads three and one-half tons of grapes in four and one-half minutes, a tremendous time-saver over the previous loading of boxes by hand. At the crushing platform, hydraulically-operated bulldozer blades eliminate all manual pitching and, with a single operator, crush 600 gallons a day.

The only school for wine-growers in this country was established at the University of California three-quarters of a century ago. Many of the modern scientific methods used in today's wineries have come since then from its laboratories.

To bring to a successful culmination the hard and exacting labor of the vineyards, work in the wineries requires patience, devotion and something of the genius of the artist. As soon as they are picked, the fresh grapes are rushed to the wineries, examined and weighed. Then a mechanical crusher sets the juice free, first separating the grapes from their stems with a delicacy that avoids breaking the seeds.

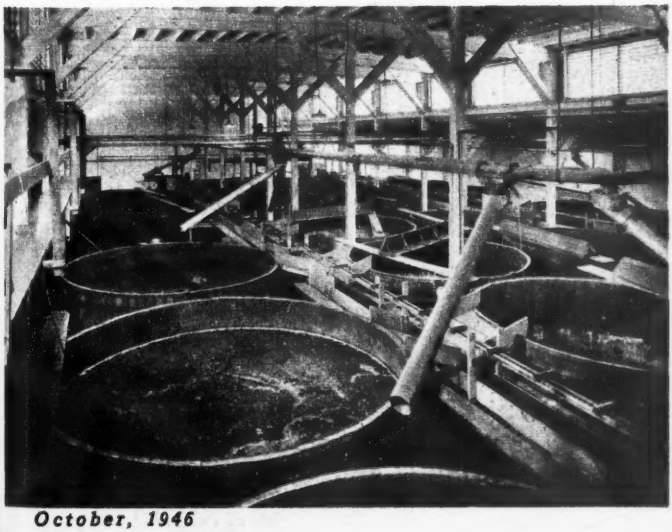
California makes the traditional wine grapes of the Old World completely at home, and they yield her new wines of wonderful flavor, completely her own.

Winery experts checking on the aging of a cask, having pulled a sample with a "thief."

The crushed grapes and their juice are pumped into large fermenting vats. Here, by the action of wine yeasts, the natural grape sugar is transformed into carbon dioxide gas and wine alcohol. Complete fermentation produces dry wines, such as dry sherry and vermouth. To keep wines sweet, fermentation is arrested while the desired proportion of natural grape sugar remains.

To stop fermentation and produce sweet wine, three methods are used: the adding of a little pure grape brandy, the use of a small quantity of sulphur dioxide, and pasteurization, such as is used to protect milk. Wine kept sweet by the last two methods, however, remains perishable, cannot be stored or shipped in large quantities, and must be kept in bottles.

Expert control during fermentation is one of the most important factors in maintaining quality. Day and night the watch is kept, for wine generates heat as it ferments and its temperature must not go over 85 degrees. High temperatures cause it to lose bouquet and allow vinegar bacteria to develop.



The fermenting vats require careful watching day and night, to keep the temperature right.

Bottles are being sterilized (rear), filled (machine at left), and corked (front). The equipment used is typical.

Red wine is fermented with the pulp and skin of the grapes and colored by the natural pigment. White wine is fermented from the juice alone, which is drawn off immediately after the grapes are crushed.

After fermentation, the juice is drawn off or pressed from the solids. Wine presses of the "basket" type are operated hydraulically in California vineyards. A press does not crush fresh grapes, as is so commonly supposed. It presses the wine out of pulp already crushed before fermenting. Wine that is drawn off before pressing is called "free run" and is better than the press wine.

After being pressed or drawn off, the new wine goes to storage casks for the aging and perfecting. This takes months or years, depending on the type and quality of the wine. Here it must still be watched and tended.

Cask temperature is kept close to 55 degrees. Mysterious chemical changes take place, creating smoothness, mellowness, flavor, bouquet. The aging is usually completed fairly early, but age itself is not a positive guide to quality.

Most wines are blended, and blending is an important art. Each wine in a combination supplies some desirable characteristic that the others lack. Old wines may be improved by blending into them a little young wine to give freshness or fruitiness of flavor.

There is a sediment in wines during processing and to clear it away they are sent through clean filters or stored in cool rooms for set periods.

When wine has improved in the wood to the highest possible point, it is "ripe" for bottling. It should not be left in the casks too long. Some wines improve further as they age in the bottle.

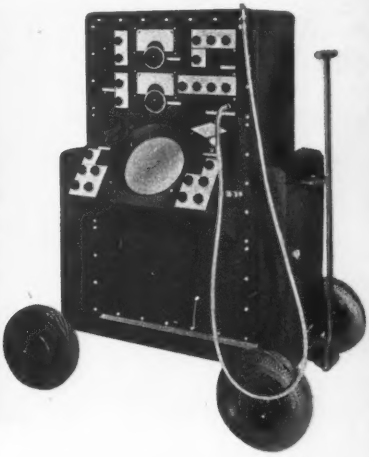
The stoppage of wine imports during the war increased enormously the demand for domestic brands, and in spite of Government restrictions and labor shortages California's wine industry boomed. Now, with the removal of restrictions and with labor again adequate, the outlook for future expansion is indeed impressive.

Yes, California's vines have tender grapes—and her wines are the equal of any in the world.

Bottling line at the Italian Swiss Colony winery. The aging of many wines is finished in the bottle.

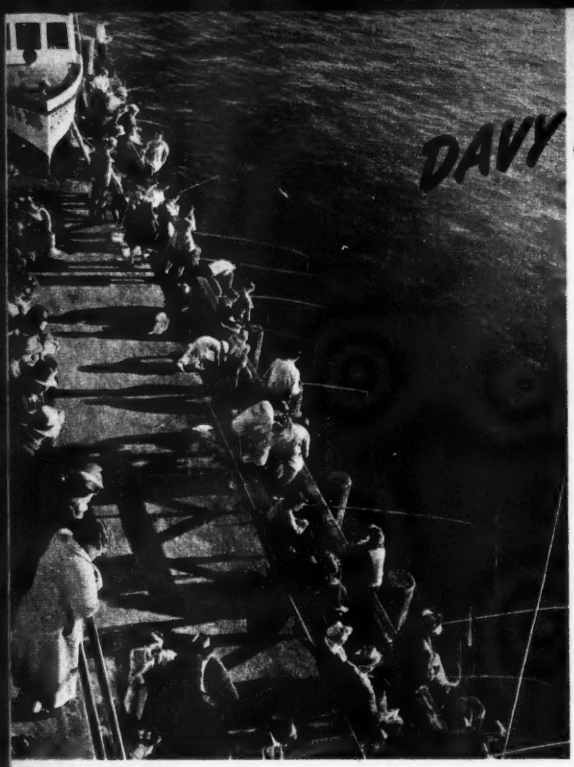
Supersonic Tester

DETECTION of flaws in metallic parts up to 10 feet in thickness is the supersonic trick accomplished by the Reflectoscope. As the operator presses the quartz crystal searching unit against the steel, the apparatus sends out vibrations standardized at from one to five million cycles per minute—far beyond frequencies heard by human ears. The vibrations pass through the steel and are bounced back either by the far side or by a flaw—the oscilloscope immediately shows which.



Planting Gun

THE newest wrinkle in helping nature restock burned forest lands is the Oregon tree-planting gun. With this handy tool, a workman can plant as many as 2,400 Douglas firs a day. He places the seedling, whose roots have been wrapped with a year's supply of peet moss (K rations to a tree), in a slot and presses the two-inch steel finger into the ground. A trigger ejects it, and presto! Nature transforms it into a sawlog—somewhere around 2016 A. D.

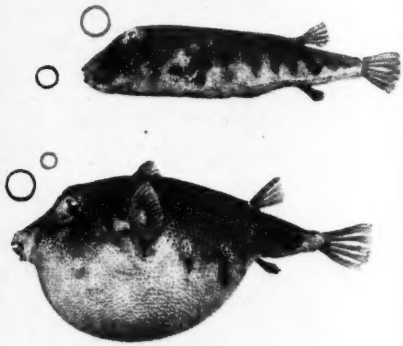


DAVY JONES' CHOIR

BY LESTER DAVID

Anglers may get the fish, but they generally miss the music.

The globe fish puffs way up, then grunts cole like a hog.



"SOUNDLESS" seas, my eye! "Quietly-flowing" brooks and rivers, my neck! Shed a tear for another busted illusion, brother, because the clock just struck twelve and Cinderella is running through the ballroom in her raggedy hand-me-downs and her slip showing.

For years the poets talked rhapsodically about the "silent denizens of the deep," but ichthyologists—fishermen with canes—snort and say they are about as silent as a boiler-makers' convention held under a tin-roofed building during a hailstorm. They say that fish all over the world give out with the oddest and noisiest jazz concerts you've ever heard.

Yessir, hep-catfish and their finny tribesmen give out with the fishiest, noisiest, jammiest jazz concerts on record.

Take practically every sound in the field and jungle and you will find a near-duplicate under water. Because fishes can yowl, groan, grunt, bleat, shriek, squeal and hum in an aquatic serenade of assorted fortissimo tones, as harmonious as the dulcet whisperings of Dodger rooters on a losing day at Ebbets Field.

And looka me fellers, no vocal cords!

No, fishes don't have voice boxes, but it's by no means a handicap. They produce their sounds by vibrating their air bladders, either by the rapid tugs of attached muscles or by sliding muscles over the tightened membranes.

Some vocalize by grinding their lower pharyngial teeth together or rasping with their gill covers.

Others make clicking sounds just by snapping their heads sharply upward.

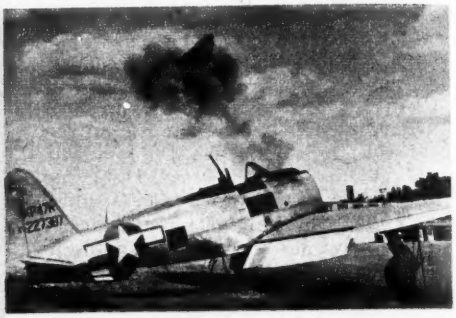
The blinney seems quiet enough, coiled in his nest—but he can shriek like a banshee.

Remember the classic myth of the siren's song which floated over the horizon and lured good seamen and true to their doom? It was a good story and made nice telling over a foaming tankard, but unfortunately it was a fish story in the best sense of the term.

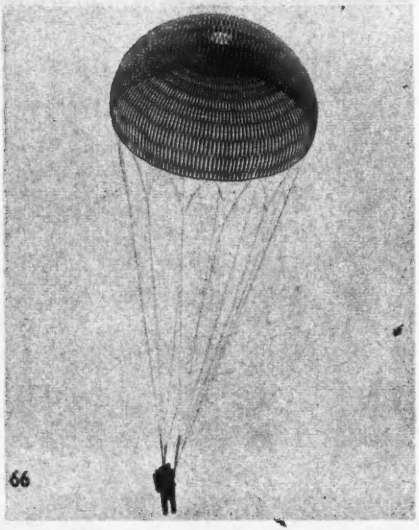
The "siren's song," now it can be told, was merely the warbling of warm-water fishes like the singingfish or midshipman, that produce weird, human-sounding tones which can [*Continued on page* 161]

The bow-fish may look like a fellow without talent, but he "sings" with bell-like notes.

Escape from a high-speed plane has been made possible by these three new devices.



High Speed Bail-Out



PLANE speeds are increasing wonderfully—and the pilot finds himself in growing danger.

The pilot is a good man. He can fly the new planes. But, if he gets into trouble, how can he escape from the new planes alive?

Bail out? At ultra-speed a man's hand stuck from the cockpit would take a blow of 200 pounds. On the face or body the blow of the air would be deadly. If he should by some miracle of strength [*Continued on page* 163]

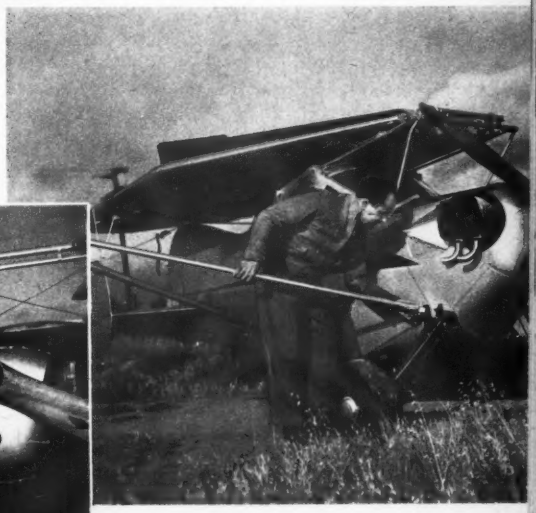
Above left is a pilot in the Ejector Seat, his hand on the trigger which fires the gun which will shoot him, seat and all, away from a high-speeding plane in safety; and at right, a demonstration made on the ground with a dummy. At left, a parachute made of nylon ribbons, for use in long free falls.

As with any auto, you stop at the roadside gas station and say, "Fill 'er up." Then, arrived at a level area, you park, put on the wing struts, and fold down the wings.

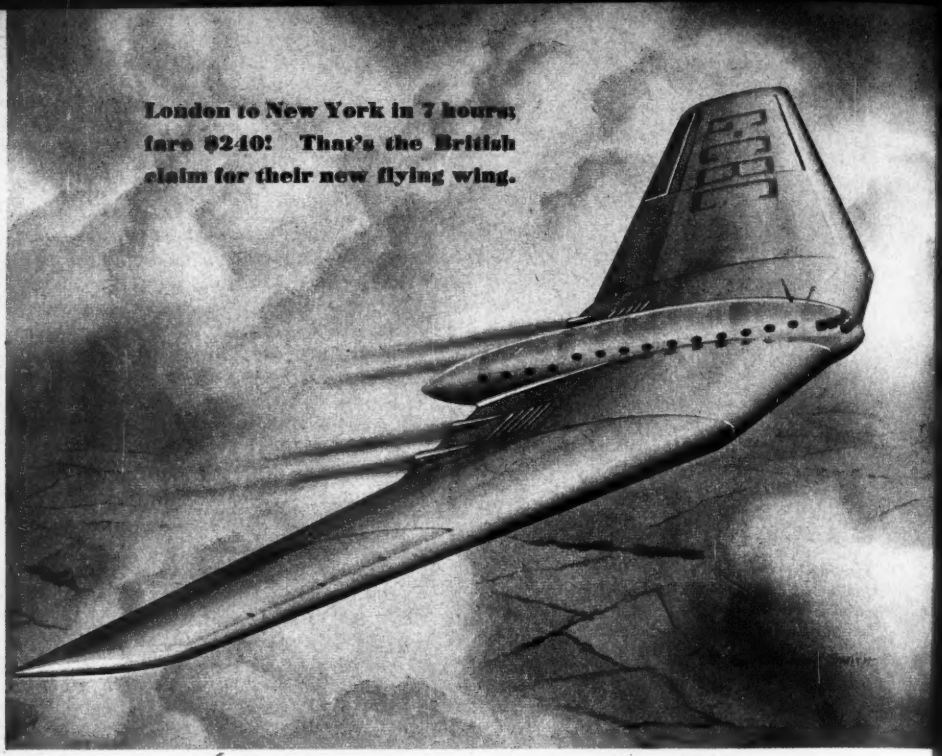
Plane-Auto

IF YOU could take a peek at yourself driving along some time not too far in the future, you'd probably get a bit of surprise at the kind of vehicle you were in. It wouldn't be an auto. It wouldn't be a pure plane, either, though it would look like one. It would be a combination of the two.

Your vehicle would be kept at home, in your garage. To go somewhere you'd back it down the driveway to the [*Continued on page* 165]



You fasten the wings; safety locks will prevent their folding in flight. The engine is already warmed up, so in another minute or so you're in the air.

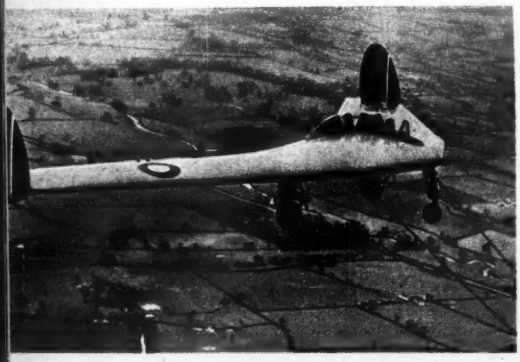


Lion grows a wing

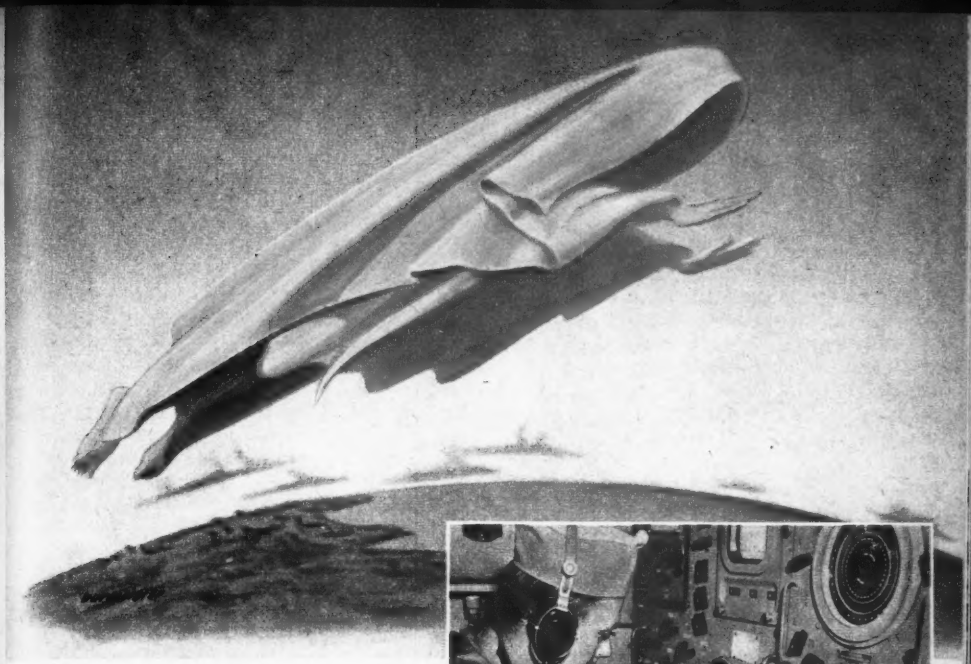
FOR some months a weird, soundless aircraft has swooped and glided over certain parts of England. This silent craft has been towed aloft behind powered aircraft and released at around 12,000 feet to soar and dart back to earth, these return trips sometimes lasting over half an hour. Upon landing, a ground crew has quickly pushed it within a hangar and hurriedly closed the doors behind it.

This unusual aircraft is a small scale, yet man-carrying model of the British Lion's bid for leadership in the flying wing race, now so conclusively held by the Northrop XB-35. With much "hush-hush" and secrecy the giant British wing has been slowly taking shape in the experimental hangars of Armstrong-Whitworth at Coventry.

Although stories of its being capable of carrying 50 passengers and crew from London to New York in seven or eight hours are not official, certain facts about the wing are more than [*Continued on page* 165]



This model glider was the guinea pig for the four-jet mother wing nearing completion.



Radar Spook

It's the riddle of the airways—radar doesn't lie but it detects something that just isn't there.

SPOOKS ride the airways!

Throughout the war, radar men were plagued by what they came to call the radar "spook." Echoes bounced back when there was no discernible object to bounce from and it was a common occurrence to track one of these invisible somethings for five or ten minutes, until it suddenly "vanished," then immediately pick up another to windward or overhead.

The mystery is still unsolved. Only speculative explanations have been offered for the riddle. The best one—unless you go along with the ghost theory—is that the spooks are isolated masses of water vapor. This has been thought most probable by Millard W. Baldwin, Jr., of the Bell Telephone Laboratories; but he is not ready to accept any explanation as final until more data is obtained.

Radar spooks usually move downwind at slightly more than prevailing wind velocity. In one sense they are earthy. They're seldom found at altitudes over 7,000 feet. Although birds have been known to cause radar echoes, Mr. Baldwin does not believe them responsible.

Superstitious folk claim the "things" were spirits of departing heroes, but science says it's just a catchy problem not yet ironed out.

Radar spooks did not prevent radar from becoming highly successful during the war, however. The United States Navy's amphibious flagships, equipped with the latest in radar, were the nerve centers for many vital Allied invasions.

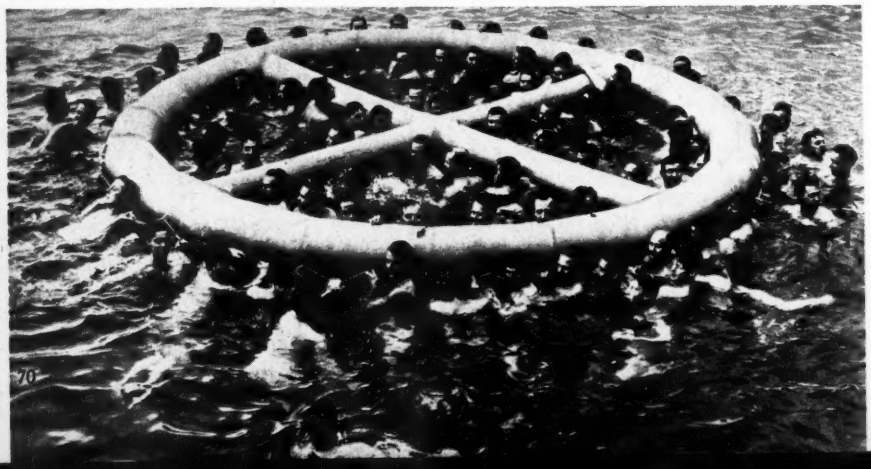
In the accompanying photograph a skilled Army radar operator on the U.S.S. Ancon, from which the invasions of Sicily and Normandy were directed, scans the surrounding area to see that all's well.

Wheel and Covered Wagon

NATURE has strange ways of repeating itself. In frontier days, covered wagons traversed the far reaches of the western plains. Today, airplanes travel the vast expanses of the sea and again the covered wagon comes into use—if the planes ever make unscheduled stops in mid-ocean.

Easily inflated with an attached bottle of carbon dioxide gas, the "Covered Wagon" shown above is luxury afloat for survivors of sea disasters. In addition to the canopy which protects occupants from sun and rain, the high side walls keep out salt spray which caused so much suffering in life-saving equipment used during the war. Ideal for passenger planes and large bombers making long flights over water, the Covered Wagon weighs 178 pounds when packed for stowing and takes up 12 cubic feet in its container.

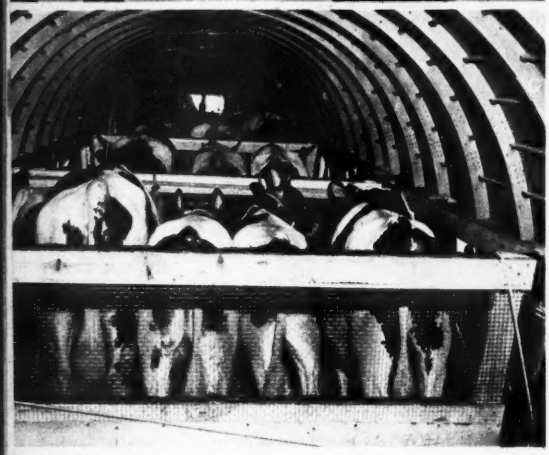
The "Wheel" shown below, another item of equipment for the Sea Squatters Club, will accommodate 104 men. It is inflated like the other, weighs 79 pounds and takes up only three cubic feet when packed. The Wheel can be launched in a hurry in case of a sea disaster.



SCIENCE IN PICTURES

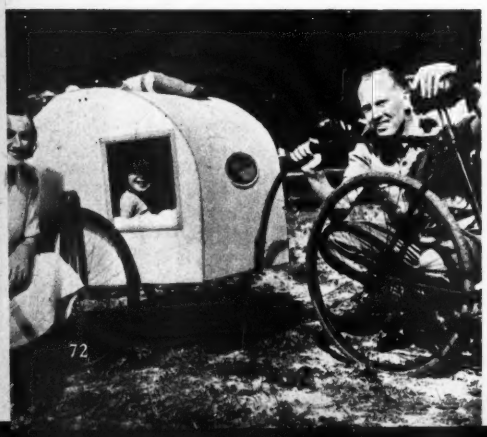
No put-put for this outboard motor boat fan of merry old England. Thanks veddy much, he'll take a vibrationless sizzle instead. Yes, his motor is jet-propelled! Named the "Aquajet Minor," it weighs only 55 lbs., runs for four hours on a gallon of gas and propels a boat up to eight mph. R. M. Parkinson, the inventor, says it will sell for about $170. (See "Jet Boats Are Coming" in September MI.)

All Wet but it never misses a put even after this man-made downpour. No more weary fishermen rowing home after a sudden storm at the far end of the lake. This improvement in the conventional type, outboard gasoline motor is made possible by a silicone compound developed by Dow Corning for wartime use in Army and Navy aircraft. It's a non-melting, waterproof insulating paste. A thin coating over wires, spark plugs and fly wheel makes them weatherproof. C. E. Sanford of Midland, Michigan, is the rainmaker in the picture at right.

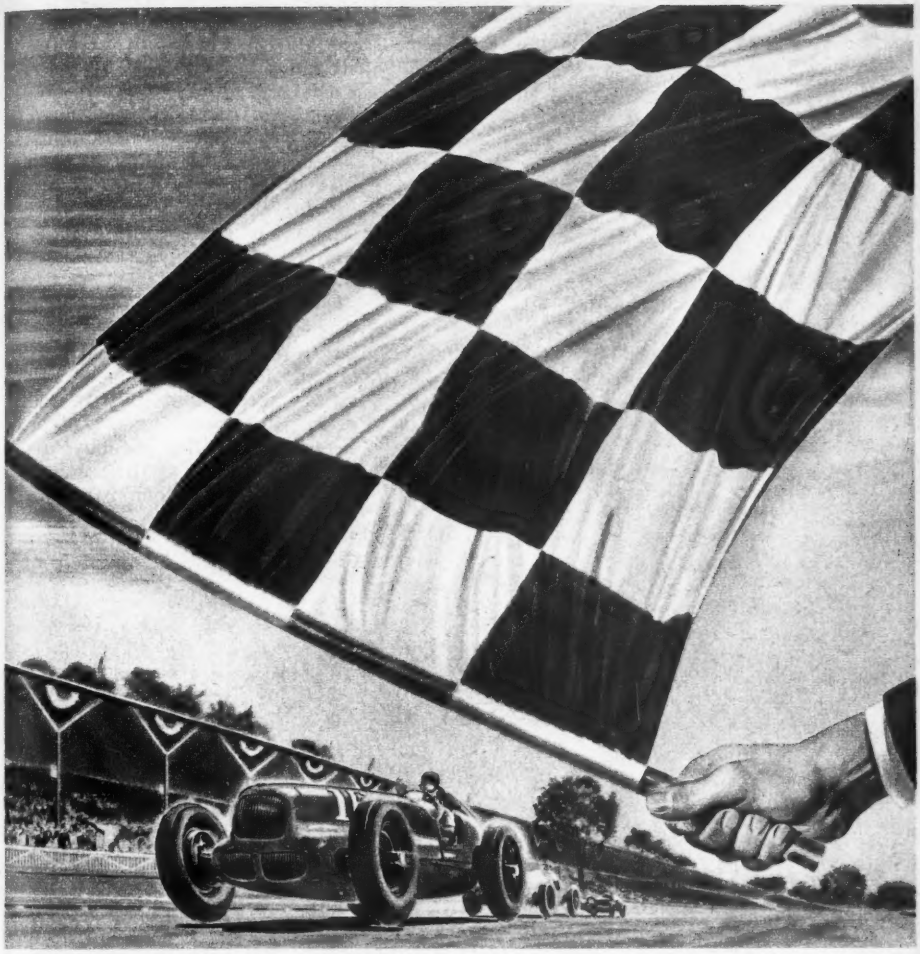


Hi, Diddle, Diddle... the cow jumped over the moon! Well almost, anyway. These ten pure-bred Ayrshire cattle—four heifers and six bulls—took off from La Guardia Field, New York, and came back to earth 20 hours later in Columbia, South America. One bale of hay was ample for the entire journey. In addition to the distinction of being the first cattle to make an aerial journey, the animals are worth more than $1,000 each. Latin American dairy farmer Francisco Roldan, to whom they were consigned, reported the bovine passengers were perfectly content upon arrival. The plane is an International Air Freight Douglas DC-3.

Trailer Baby is all in favor of this handy little bike buggy that papa built. No more sitting at home with the sitter and no more danger of falling off the handle bars! Besides doing all the work of pedalling, papa R. Loudon built the neat gadget in his home workshop.



Nothing's Too Good for dem bums the Brooklyn Dodgers! Football really goes scientific with the invention of the pneumatic bucking, blocking and tackling machine. Inventor Mal Stevens, coach of the Dodgers' professional gridsters, watches the gauges which record the force expended, while Jim Worst in foreground bucks against Sam Flowers and Tom Scott.



GEORGE ROBSON *wins Indianapolis Race with dependable*

CHAMPION SPARK PLUGS

TELEGRAM Indianapolis, Ind., May 30, 1946

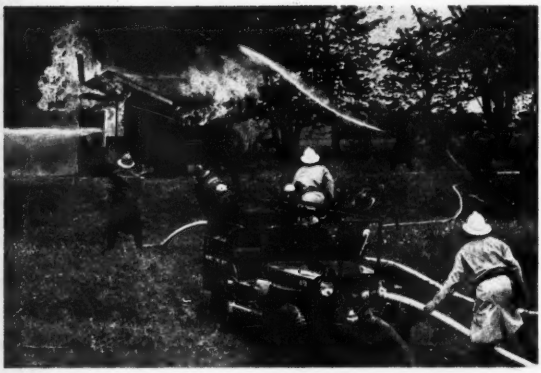
CHAMPION SPARK PLUG CO.,
TOLEDO 1, OHIO

Many thanks to Champion for their wonderful spark plugs which helped me win the Indianapolis 500-Mile Race today stop the Champion Spark Plugs in a Thorne Eng. Special performed perfectly without a change all through the race.

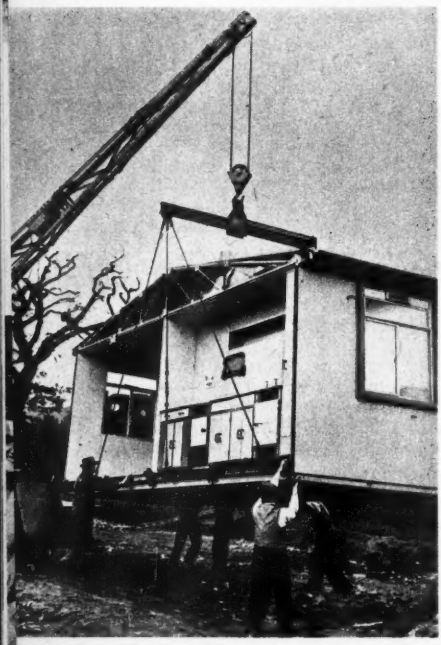
GEORGE ROBSON

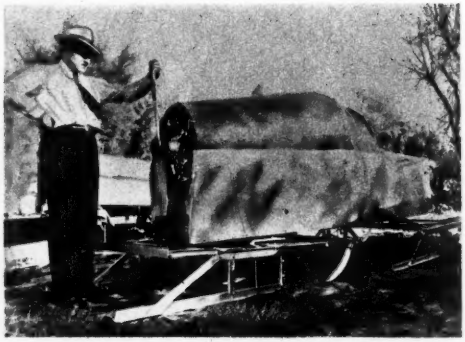
Once again Champions were proved Champions in fact as well as in name in the 1946 Indianapolis Race. Dependable Champion Spark Plugs equipped the winning car, the first six to finish, and nine of the ten money winners. In the last 19 races, eighteen winners and 177 out of 190 cars finishing in the money were Champion equipped—irrefutable evidence that Champions are the choice of experts.

FOLLOW THE EXPERTS . . . DEMAND DEPENDABLE **CHAMPIONS** FOR YOUR CAR



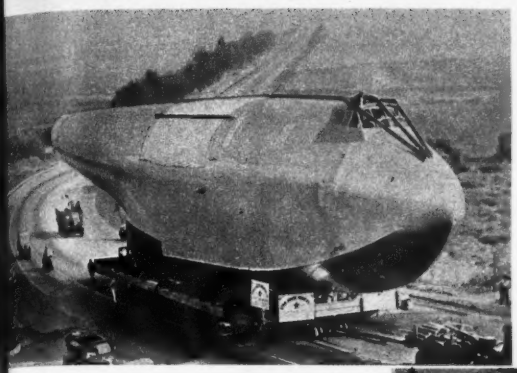
Jeep Leaps through the creek and it's all in the day's work to Berkey, Ohio, volunteer firemen when there's a fire beyond reach of the city's water mains. These ingenious firemen have made the already ubiquitous jeep into a firefighter which goes practically anywhere fast. Besides complete equipment, it carries five firemen. There's no rest for the sturdy jeep firefighter. After it reaches the source of alarm, it has to pump the water that puts out the fire. The auxiliary hose on the jeep's nose leads to the nearest duck pond, horse tank or cistern. Looks like the boys arrived a little late in the scene at left but it's just a demonstration.



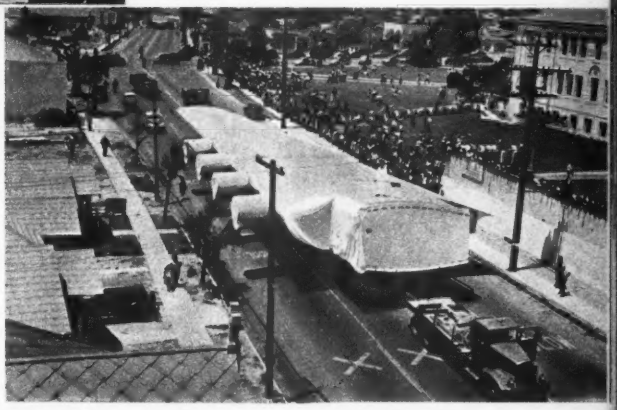


Propmobile Bobsled pusher designed to frisk over the snow at 90 mph is the invention of Ralph B. Simmons of Los Angeles. It will sell for about $1,000.

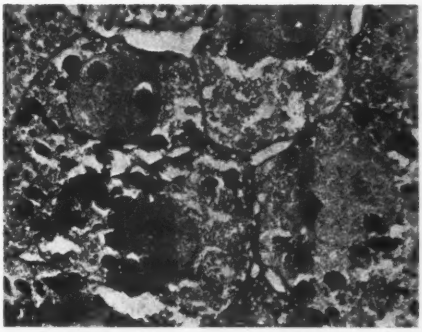
Vacancy! Order today and move in tomorrow is wot the Limeys claim for the prefabricated aluminum bungalow at left. It's the British answer to the universal stumper: "Where can I find an apartment?"



World's Largest airplane, Howard Hughes' "Hercules," crawls along in parts on its way to the dock in Long Beach, Calif. That's the 220-foot-long fuselage at left. School wouldn't keep when a wing section of the mammoth, eight-engined seaplane passed the Hermosa Beach High School, as shown below. Farther down the road you can see the second wing section of the giant flying boat.



Two In One bucket is demonstrated by beauteous Patricia Streight. The suds go in one side and fresh water in the other. It's a great labor saver claim inventors Edward and Merle Davis of Springfield, Ill. But what we want to know, and maybe you too, is how to change rinse water without spilling the suds.



Guess What! Close-up of the moon? Aftermath of a bombing raid? Wrong both times. It's the cross-section of a guinea pig's liver made by a high-speed Microtome and enlarged 4,500 times with an electric microscope. Rough lines are the walls of cells and the white spaces are lymph canals.

IT'S A GRAND FEELING TO LOG A NEW HAM STATION

IT'S A GRAND FEELING, TOO, WHEN YOUR CAR IS CUSHIONED WITH MARFAK CHASSIS LUBRICATION

HAM radio is fun, talking to other amateurs all over the world. A smooth riding car is lots of fun, too.

With *Marfak* chassis lubrication your car has that "cushiony" feeling . . . not for a few hundred miles, but at least a thousand.

The reason is that *Marfak* is scientifically designed for the job — its special cohesive and adhesive qualities resist wash-out, jar-out and squeeze-out.

Marfak clings to bearing surfaces — sealing out dirt and grime.

Yes, it's a grand feeling when your car is "cushioned" with *Marfak* chassis lubricant. See your Texaco Man today, and say: "*Marfak*, please!"

With ordinary grease . . . you're taking the road shocks again after a few hundred miles.

Marfak *stays on the job hundreds of miles longer — means more* velvet smooth *riding.*

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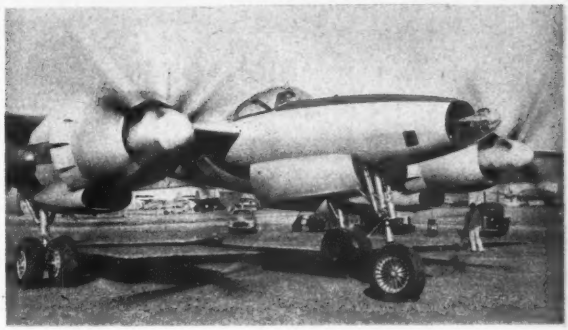
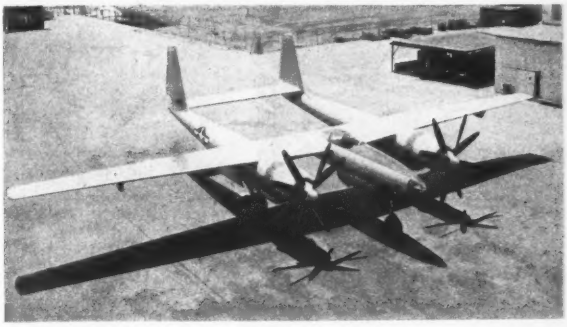
MARFAK LUBRICATION

TEXACO — THE TEXAS COMPANY

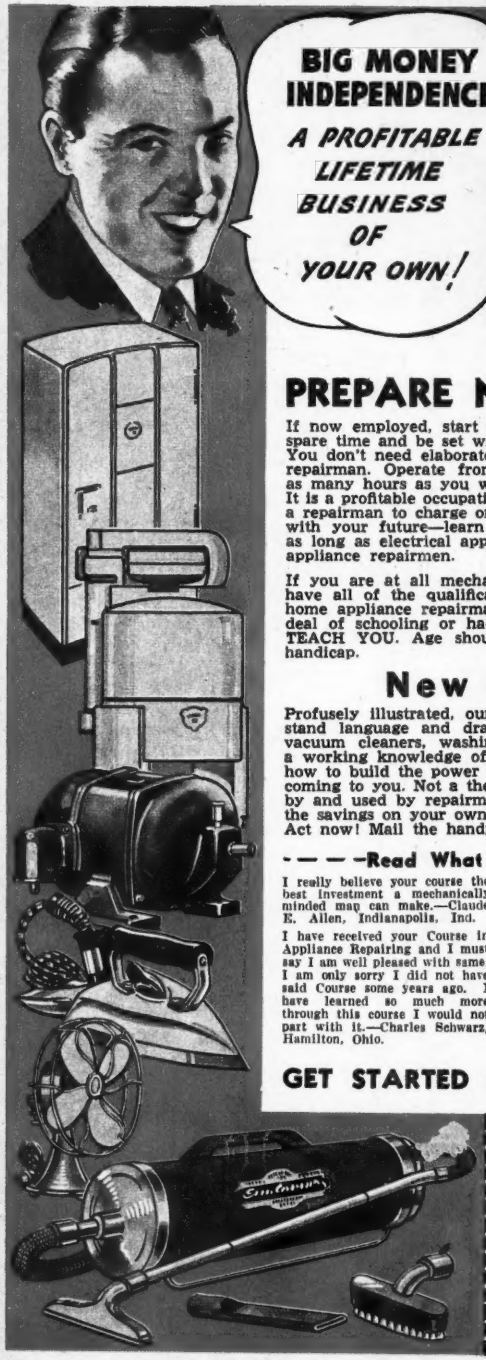
Tune in the TEXACO STAR THEATRE every Sunday night. See newspapers for time and station.

Ill Fated was this XF-11 photographic plane in which Howard Hughes crashed last July when one of the contra-rotating propellers suddenly reversed pitch and pulled backward. Built by Hughes for the U. S. Army Air Forces, the XF-11 design is for long range, photo reconnaissance missions, and speeds of more than 400 mph. Each of the 3,000 hp. radial engines powers two 4-bladed propellers which turn in opposite directions. Other features include a full-span flap, pressurized cabin and accommodations for eight cameras.





Flying Flapjack is the goofy nickname of the Navy's XF5U-1 model fighter, but to far-sighted airmen it's no joke. It's potentially the fastest—and slowest — propeller - driven aircraft. With two 2,000 hp. two-speed motors, its speed range is from 40 to 425. With gas turbines, its speed could vary from 0 (zero) to 550 miles per hour.



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I am a mechanic for the Western Union Telegraph Co. Three days after receiving the lessons in refrigeration I earned the exact cost of the course.—Henry S. Lee, Washington, D. C.

I work day times at the shipyard and after 4:00 P.M. I operate from my cellar and garage. I average $10.00 to $15.00 clear every day.—Walter Hanby, Brockton, Mass.

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Bell's XS-1

[*Continued from page* 46]

the Bell XS-1 you are impressed with two things, its ruggedness and its sleekness. The fuselage is streamlined, glass-smooth, and fairly exudes mechanical and structural strength.

From a long, pointed snout, which is the pitot tube for instruments, its sides French-curve back to a square-cut tail which contains the ports of the four rocket engines. Well back along its sides are located the stubby, ten percent (thickness is ten percent of wing width) laminar flow wings. The tail is thin, with the horizontal control surfaces set high.

Inside the cockpit, tailored to the lanky six foot plus altitude of 29-year-old Woolams, a maze of instruments covers the walls. As I sat in the XS-1 I saw that many of the instruments would be unfamiliar to the average pilot. They were for the powerful rocket engines and research equipment whose "plumbing" honeycombs the wings and control surfaces of this flying research aircraft.

To the right, on the wall of the cockpit, is a red lever to release the sealed door of the XS-1, if need be, and also open a vent in the cockpit side to permit the air pressure to drop just before the door bursts away. This "valving" of the pressure prevents explosive decompression of the cockpit and injury to the pilot, as would be a probability in a complete instantaneous evacuation of the pressure through the door.

The power plant consists of four liquid-fuel rocket-engines developed by Reaction Motors, Inc., of Lake Denmark, N. J. These motors, fed by a burning spark-ignited mixture of liquid oxygen and alcohol, have a duration of roughly a quarter of an hour on one, or a fraction of that for any group of them together.

Now that we have seen what the tool to crack the sonic barrier is like, let us see how it will be used. Already it has had its baptism of flight, for ten times Jack has piloted it down to earth from heights of thousands of feet as a powered glider. Carried aloft in the redesigned bomb bay of a Bell-built Boeing-designed B-29 Superfortress, it has been released as high as 25,000 feet. Its performance was perfect.

The launching from the bomb bay of the B-29 has two advantages. First, it permits the ship to be launched already high in the air at a great saving of valuable fuel, and second, it does away with the high-speed type of takeoff. (Vertical takeoffs are particularly hazardous to the pilot, as witness the experiments by the Germans with their vertical-takeoff rocket-powered Bachem BP. 20B, or "Natter," which slightly resembled the XS-1. Several pilotless launchings were made and then a German pilot tried a takeoff. Period.)

As the bomber launchings of the XS-1 were (and will be) made at high altitude the crews practiced its procedure many times, as well as rescue of any members that might be overcome by the altitude. Nothing has been left to chance. The XS-1 fits snugly into the altered bomb bay of the B-29. It is hung from one of the largest and strongest bomb shackles made.

When ready for the loading the XS-1 is backed tail first into a pit in the ground and the bomber wheeled over it. Winches inside the bomber smoothly raise it into position within the bay. Woolams flies in the bomber during the takeoff in case of trouble, for the XS-1 clears the ground by but eight inches during the run. Once aloft, at about 10,000 feet, he will give a signal and a shielded ladder will be lowered alongside the research ship. He will climb down this protected ladder dressed in a new-type made-to-measure pressure suit and wearing his aneroid parachute, and enter the sleek hull of the huge "bomb."

Jack's description of the glider flights of the XS-1—"It was like flying in a dream"—was greatly due to the absolute silence of the aircraft. The cleanness of the design and thick covering make the cockpit "as silent as being locked in a vault," though Jack could hear the roar of the bomber fading out above him as he fell away in free flight.

The performance of the XS-1 under rocket-motor power is not yet for publication, nor are many details of its interior and motors, though the craft is by no means a military one. Of course the designers, the motor builders and the pilot all have hopes. It may reach a Mach number of 1. It may reach 2. No one knows. It has the best engineering in the world, the tops in pilots, and the latest (to date) in liquid rocket motors.

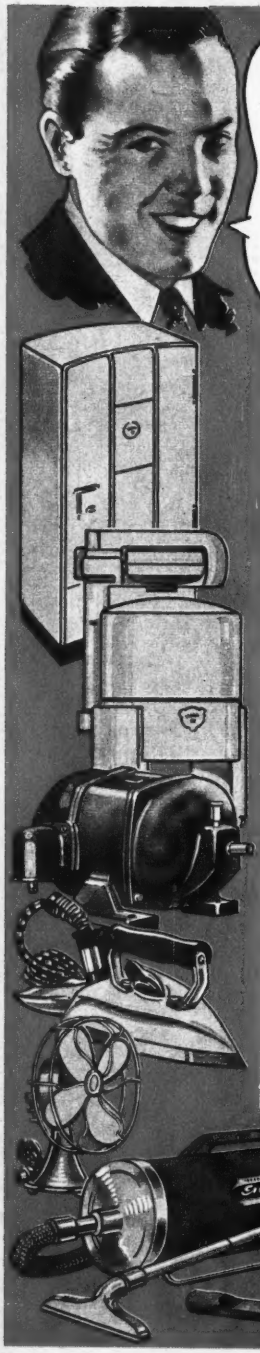
What this combination will produce in performance is hard to predict, but there is little doubt that, as the radar tracks this first of the supersonic aircraft to come across the sky above a secret airbase later this year, it will be recording not only the engineering genius of American research and the historic flight of a gallant pioneer in the cockpit, but the shattering of the last barrier to man's *complete* conquest of the air!

New Ektachrome Color Film

Kodak Ektachrome, a new color film intended for simple processing by photographers in home darkrooms, was announced by the Eastman Kodak Company, at the recent annual convention of the Photographers' Assn. of America, in Chicago.

Ektachrome will come in all current Kodachrome Sheet Film sizes, in daylight and 3200 K. (Type B) tungsten types, priced at approximately one-half the price of equivalent Kodachrome sizes.

The home-processing chemicals, designed specifically to minimize any possible skin irritation, come in kits to make ½, 1 and 3½ gallons of solution. Complete development takes 90 minutes.



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The Course in Appliance Servicing arrived a few days ago. Want to take out a few minutes of my valuable time to let you know that this is just what I have been looking for ever since I opened up my Fix-It shop. I must admit that you told the truth when you said that it contains quite a bit more information than I bargained for.—P. J. Breti, Sebring, Ohio.

I am a mechanic for the Western Union Telegraph Co. Three days after receiving the lessons in refrigeration I earned the exact cost of the course.—Henry S. Lee, Washington, D. C.

I work day times at the shipyard and after 4:00 P.M. I operate from my cellar and garage. I average $10.00 to $15.00 clear every day.—Walter Hanby, Brockton, Mass.

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Bell's XS-1

[*Continued from page* 46]

the Bell XS-1 you are impressed with two things, its ruggedness and its sleekness. The fuselage is streamlined, glass-smooth, and fairly exudes mechanical and structural strength.

From a long, pointed snout, which is the pitot tube for instruments, its sides French-curve back to a square-cut tail which contains the ports of the four rocket engines. Well back along its sides are located the stubby, ten percent (thickness is ten percent of wing width) laminar flow wings. The tail is thin, with the horizontal control surfaces set high.

Inside the cockpit, tailored to the lanky six foot plus altitude of 29-year-old Woolams, a maze of instruments covers the walls. As I sat in the XS-1 I saw that many of the instruments would be unfamiliar to the average pilot. They were for the powerful rocket engines and research equipment whose "plumbing" honeycombs the wings and control surfaces of this flying research aircraft.

To the right, on the wall of the cockpit, is a red lever to release the sealed door of the XS-1, if need be, and also open a vent in the cockpit side to permit the air pressure to drop just before the door bursts away. This "valving" of the pressure prevents explosive decompression of the cockpit and injury to the pilot, as would be a probability in a complete instantaneous evacuation of the pressure through the door.

The power plant consists of four liquid-fuel rocket-engines developed by Reaction Motors, Inc., of Lake Denmark, N. J. These motors, fed by a burning spark-ignited mixture of liquid oxygen and alcohol, have a duration of roughly a quarter of an hour on one, or a fraction of that for any group of them together.

Now that we have seen what the tool to crack the sonic barrier is like, let us see how it will be used. Already it has had its baptism of flight, for ten times Jack has piloted it down to earth from heights of thousands of feet as a powered glider. Carried aloft in the redesigned bomb bay of a Bell-built Boeing-designed B-29 Superfortress, it has been released as high as 25,000 feet. Its performance was perfect.

The launching from the bomb bay of the B-29 has two advantages. First, it permits the ship to be launched already high in the air at a great saving of valuable fuel, and second, it does away with the high-speed type of takeoff. (Vertical takeoffs are particularly hazardous to the pilot, as witness the experiments by the Germans with their vertical-takeoff rocket-powered Bachem BP. 20B, or "Natter," which slightly resembled the XS-1. Several pilotless launchings were made and then a German pilot tried a takeoff. Period.)

As the bomber launchings of the XS-1 were (and will be) made at high altitude the crews practiced its procedure many times, as well as rescue of any members that might be overcome by the altitude. Nothing has been left to chance. The XS-1 fits snugly into the altered bomb bay of the B-29. It is hung from one of the largest and strongest bomb shackles made.

When ready for the loading the XS-1 is backed tail first into a pit in the ground and the bomber wheeled over it. Winches inside the bomber smoothly raise it into position within the bay. Woolams flies in the bomber during the takeoff in case of trouble, for the XS-1 clears the ground by but eight inches during the run. Once aloft, at about 10,000 feet, he will give a signal and a shielded ladder will be lowered alongside the research ship. He will climb down this protected ladder dressed in a new-type made-to-measure pressure suit and wearing his aneroid parachute, and enter the sleek hull of the huge "bomb."

Jack's description of the glider flights of the XS-1—"It was like flying in a dream"—was greatly due to the absolute silence of the aircraft. The cleanness of the design and thick covering make the cockpit "as silent as being locked in a vault," though Jack could hear the roar of the bomber fading out above him as he fell away in free flight.

The performance of the XS-1 under rocket-motor power is not yet for publication, nor are many details of its interior and motors, though the craft is by no means a military one. Of course the designers, the motor builders and the pilot all have hopes. It may reach a Mach number of 1. It may reach 2. No one knows. It has the best engineering in the world, the tops in pilots, and the latest (to date) in liquid rocket motors.

What this combination will produce in performance is hard to predict, but there is little doubt that, as the radar tracks this first of the supersonic aircraft to come across the sky above a secret airbase later this year, it will be recording not only the engineering genius of American research and the historic flight of a gallant pioneer in the cockpit, but the shattering of the last barrier to man's *complete* conquest of the air!

New Ektachrome Color Film

Kodak Ektachrome, a new color film intended for simple processing by photographers in home darkrooms, was announced by the Eastman Kodak Company, at the recent annual convention of the Photographers' Assn. of America, in Chicago.

Ektachrome will come in all current Kodachrome Sheet Film sizes, in daylight and 3200 K. (Type B) tungsten types, priced at approximately one-half the price of equivalent Kodachrome sizes.

The home-processing chemicals, designed specifically to minimize any possible skin irritation, come in kits to make ½, 1 and 3½ gallons of solution. Complete development takes 90 minutes.

Published in The Interest of Parents . . . Present and Future Air Rifle Owners . . . The Public

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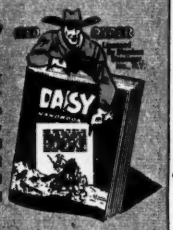

MEMORIZE THE SHOOTER'S SAFETY PLEDGE!

I pledge myself to PROTECT animals, property and people in my community by always aiming and shooting my Daisy safely!

SAFETY TIPS

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Careless bicycling may cause accidents! Always ride single file. Never "hitch on" to car or truck. Follow all traffic signs, rules. Avoid ruts. Ride close to right edge of road. Use hand signals for turns, stops.

ROLLER SKATE SAFELY...

Avoid roller skating accidents by being careful. Always skate on sidewalk. Come to stop at curbs. Cross streets at corners only. Do not "hitch" on to bicyclists. Cross small cracks at right angles.

DRIVE SAFELY...

An average of more than ONE MILLION children, women, men are injured every year in traffic accidents! Think that over, Buddy! Decide now that when you are *old enough* to get your driver's license—and after you get it—you will *remember* and *follow* the safety driving rules you learned.

CROSS STREETS SAFELY...

Always stop at curb, look right and left to see if street is clear. Cross streets only at corners. Obey signal lights. Remember, an auto moves *faster* than you can run. And don't run . . . walk!

AND SHOOT SAFE BUDDY!

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wild-life miniaturist

They look like living animals, trees, plants—but you can hold them in the palm of your hand.

BY WILLIAM A. BURNS, American Museum of Natural History

HOBBIES sometimes begin in peculiar ways. Dr. George Henshaw Childs, Staff Associate in the Preparation and Installation Department of the American Museum in New York, doubtless never thought of making miniatures of wild animal life until the morning when a friend approached him with a problem.

The friend, a museum colleague, had been building a highly detailed model of his apartment, complete with tiny furniture, rugs on the floor, even little books in his bookcases. All had gone well until he came to his fireplace with its two overhanging mooseheads. He was stumped. Although his model-making technique went as far as turning out tiny chairs and tables, it did not extend to the reduction of a moose's head to one-thirtieth its actual size.

He asked Dr. Childs to make the models. Never having done anything of this kind before, Dr. Childs had to develop the technique from scratch; but so good did they turn out that he determined to go further on his own.

His first efforts after the mooseheads were single animals or birds mounted under little bell glasses. These he gave out to friends as dinner favors. Gratified with

A fox and foxhound in the wire armature stage are receiving their basic coats of plaster-of-Paris.

his continued success he enlarged his models, making painted backgrounds like those in the Museum to set them off.

Gradually he evolved a type in which the miniature is placed on a turned mahogany platform under a four-inch bell glass. No painted background is included with this type of model, but the foreground is complete with earth or snow, bushes, trees, rocks or whatever the habitat calls for.

What began as a hobby grew to a lucrative avocation. This type of miniature has become so popular that Dr. Childs finds himself unable to keep up with the demand. Sportsman's catalogs list these perfectly detailed natural habitat animal groups and collectors and sportsmen alike vie with each other to obtain a complete collection.

All the tiny animals start life as a twisted wire armature. On this basic form a preliminary coat of plaster-of-Paris is applied. Short lengths are left extending from the feet so that later, when the group is finished, they can be slipped into holes in the base to form a firm fastening.

The next step is to rough out the general shape of the animal. A small quantity of plaster-of-Paris is placed in a small saucer, mixed with water to about the consistency of cream cheese, then applied in successive coats to the armature, each coat being baked dry before the application of the next.

Dr. Childs uses a simple plywood oven heated with an ordinary 100-watt bulb, built by himself. Hinged doors seal in the heat and permit easy placement and removal. The armatures are baked thoroughly, so that the small quantities of plaster next to be applied in building up the shape of the animal will dry immediately on contact.

After the roughing out operation is completed and the armatures are dry, Dr. Childs applies semi-liquid plaster-of-Paris with a small artist's brush, building up and sculpturing the animal carefully and making each part according to scale. Any over-development or mistake is corrected at this point by scraping with a small-bladed knife or scalpel. The completed sculpture when dry is given a coat of shellac.

Oil paints are used to color the tiny animal. Dr. Childs paints each one to resemble its original as closely as possible. Bird plumage requires much delicacy of touch; it is more difficult to duplicate variations of plumage color than overall fur color. Dr. Childs has successfully copied the multi-colored feather pattern of the

Dr. Childs begins the construction of a bush. The cabinet contains most of his materials.

wild turkey, the ruffed grouse and the peacock. After the model is painted, it is again baked to insure that no moisture is left to form a vapor later on the inside of the bell glass.

Dr. Childs has shown great ingenuity in making his natural backgrounds. A winter group of ruffed grouse required a snow background, so he pounded fragments of window glass into a fine powder and sprinkled it over the wet plaster base. The resultant effect is realistic enough to make a visiting Lilliputian run for his snow-shoes and .02 rifle.

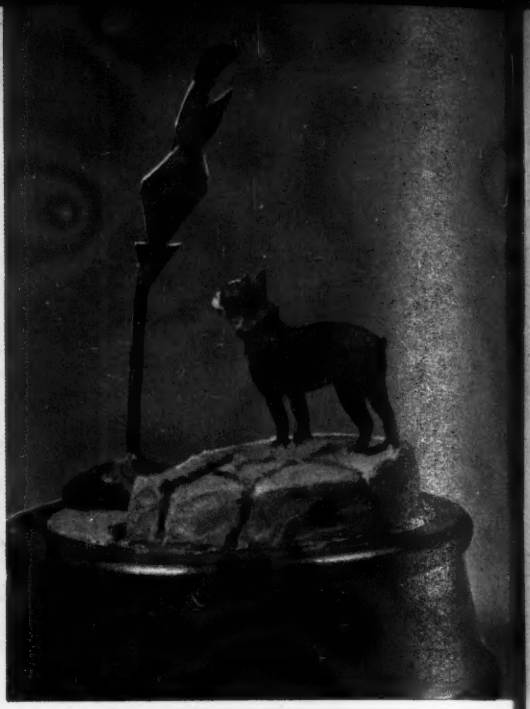
Some backgrounds require trees. These like the animals are made by twisting wires together so that three or four lengths lie spread at the top to form the main branches, then building up with plaster-of-Paris, baking, shellacking and painting. Leaves made of bits of colored or painted tissue paper are fastened to the branches. Little bunches of thread, twisted or rolled together, also may be used for leaves. Duco cement or glue may be used to fasten them to the tree. The completed tree, leaves and all, is baked again before it is fastened to the plaster base of its group.

Dr. Childs makes bushes or clumps of tall grass from frayed little twists of grocer's twine. Each clump is painted and mounted in holes punched into the plaster base. Grass may be suggested by the use of bits of wool yarn of appropriate color.

When the entire miniature is finished, complete with animals and surroundings, a bell glass is placed over the wooden stand on which the group rests. It is not fastened permanently in place because changes in temperature might crack the glass or some accident might happen to one of the animals, requiring removal of the glass for repairs.

The bell glass groups do not have painted vertical backgrounds, but strikingly realistic effects may be obtained by enclosing other groups in small boxes and painting in natural backgrounds of hills and valleys and distant trees, striving to blend the vertical painted background into the horizontal foreground of simulated trees, bushes and grass among which the animals are placed.

The vertical backgrounds for such groups are made so that the surface on which the locale is painted is curved from one side to the other. Painting the background on this half-soup-bowl surface eliminates all edges or corners and gives "distance." Fine-mesh wire, bent into the curve required, over which a stippled coat



A two-inch study of the Hindu dancer, Shan-Kar, in the guise of the god Siva. The bull terrier is a minute portrait study of a canine neighbor.

of plaster-of-Paris is brushed, provides the "canvas" for background scenery.

One of Dr. Childs' groups of this type is only six inches long, four high and three deep, but the spectator feels such a sensation of perspective and reality that the tiny pine trees in the foreground seem to tower high into the sky. A blued electric light bulb, mounted out of sight, sheds a cold wintry light on this marvelous exhibit of Virginia deer and December woods.

Some animals are easier to make than others. The beginner may find that a leaping fish will prove a better start in miniature model making than a complicated African water-hole group, complete with zebras, antelope and giraffes.

Birds, either in flight or perching, require much less time than mammals because of their smaller size and less complex body pattern. Bird feathers, of course, require more care in painting because of their color variations and the necessity of making them look like feathers instead of painted plaster.

The most difficult of all creatures to scale down to size is man himself. It takes a lot of artistry to make a miniature human look human. But even this Dr. Childs has done successfully. Mrs. Childs.

A perfect reproduction of a red-headed woodpecker—as long as your thumb nail.

Photos by Leeser, Camera Clix

An Indian gaur and running giraffe, caught as in life in wee figures that all but breathe.

formerly a Morgan dancer, posed for a figurine of a dancing girl and her talented husband has caught all the grace and delicacy of the ballet in his half-pint-sized model!

The great Oriental dancer, Shan-Kar, once inspired Dr. Childs to reduce him, in full costume, to a height of two inches. He was able to preserve the finely drawn and exotic movements of the Hindu dance he was performing. The costume is made of tissue paper stiffened with shellac. Threads of many colors were pressed into the paper while the shellac was still tacky, and manipulated by Dr. Childs until they formed the involved mosaic design of the original dance dress.

There are hardly any limitations to the variety of miniatures that Dr. Childs has attempted. His Brooklyn home contains scores of bell glass groups, together with larger groups with painted backgrounds. Animals from every corner of the globe are represented.

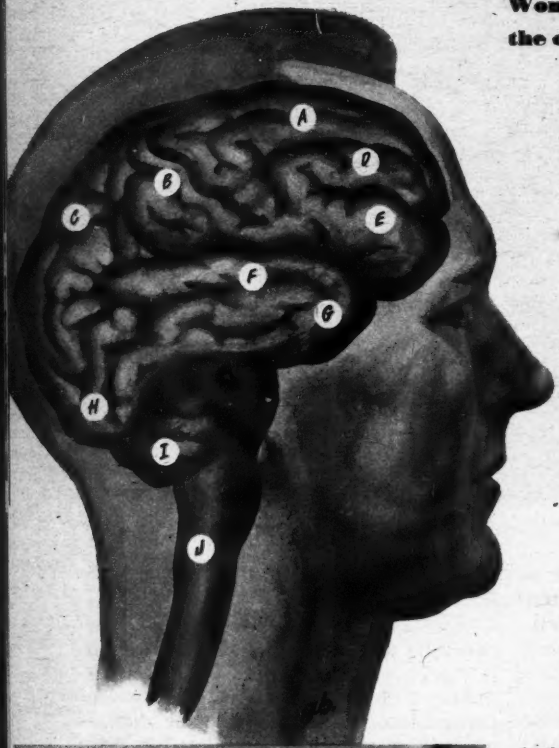
Notable is a pair of solemn blue herons, only one inch high, peering intently into the crystal-clear depths of a pond. In the pond you can actually see [*Continued on page* 166]

This group of mountain sheep stands against a subtly painted background.

A Look At Your Nerves

Wonderful—and full of mysteries—is the operation of your nervous system.

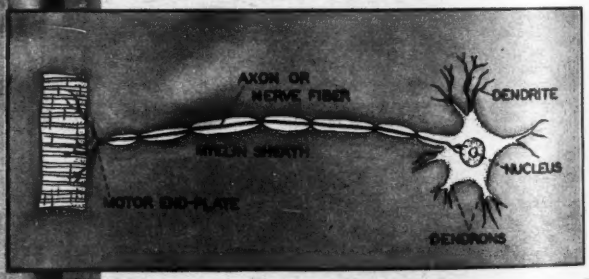
BY DONALD G. COOLEY



PLUNGE your hand into a bonfire in San Francisco at 9 a. m. and if the rest of your body is in New York you won't feel the flames until 5 o'clock the next morning—assuming that your arm is extensible enough to reach across the continent and convey the sensation of pain. The speed of thought, which is to say the speed of nerve impulses, at best is not so very fast after all: about 155 miles per hour.

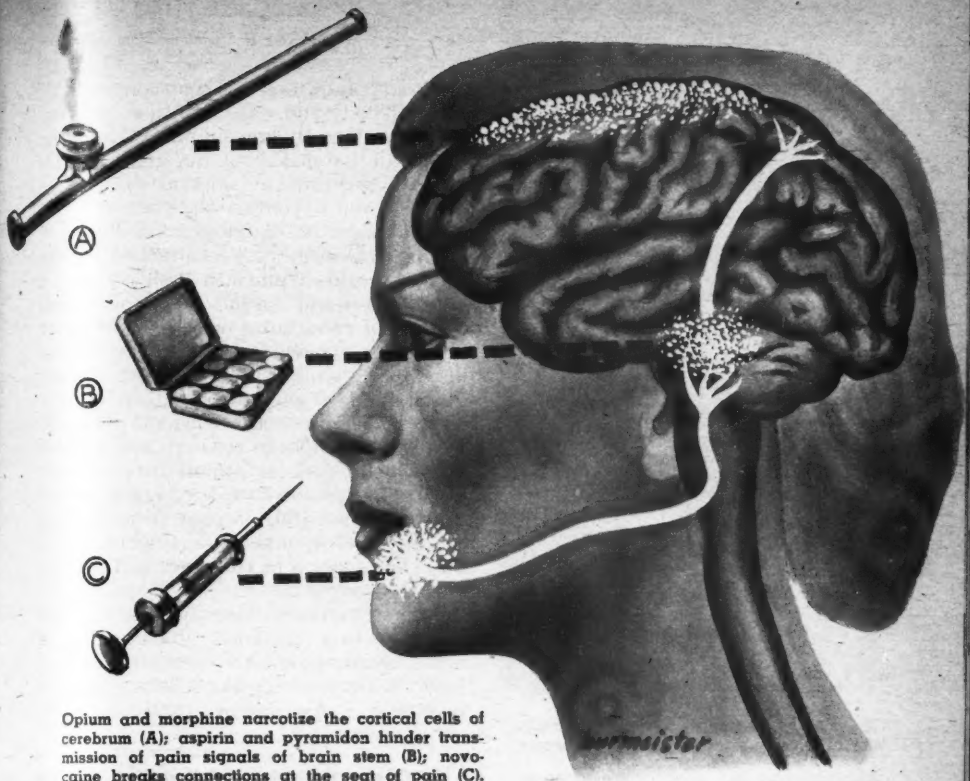
Nerve impulses are fast enough for your own good, however. If they were instantaneous you'd probably get into all kinds of jams by acting before you could think. Your nerve network makes up only one-fortieth of your weight but it tells all the other thirty-nine parts of you exactly what they can do. Thus in a sense your nervous system is your personality, your character, your genius, and it should be a pleasure

In the brain (above left), functions are localized as follows: A, trunk; B, skin and muscular sense; D, head and eye; E, speech coordination; F, hearing; G, word understanding; H, vision. C marks the cerebrum, I, the cerebellum, and J the spinal cord.



A motor nerve cell showing its connection with a voluntary muscle cell. The branching dendrites of the nerve cells make up an impulse-carrying network.

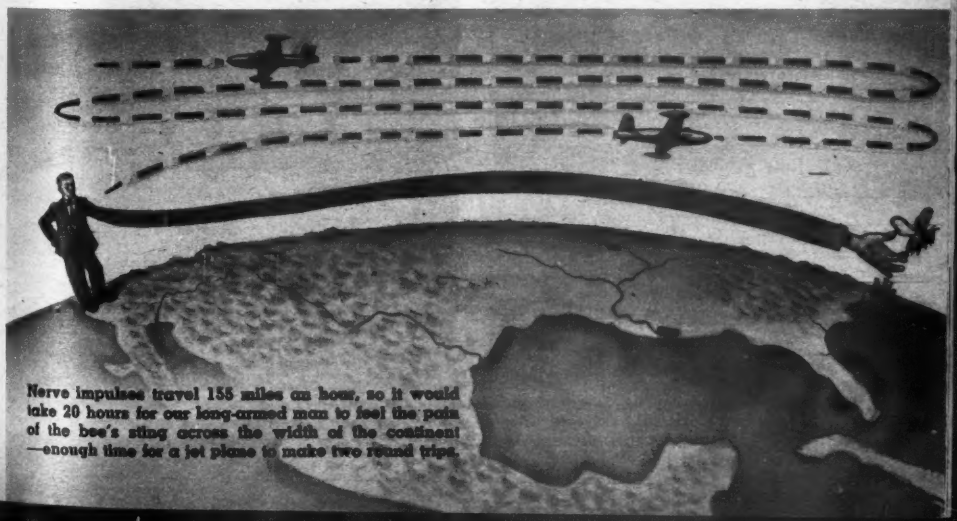
The message, "hot," is picked up by a sensory neuron, transmitted by a conduction neuron, passes through a receiving neuron, and reaches a sensory cerebral neuron. Dashes show path of motor impulse.



Opium and morphine narcotize the cortical cells of cerebrum (A); aspirin and pyramidon hinder transmission of pain signals of brain stem (B); novocaine breaks connections at the seat of pain (C).

to meet parts of it in the accompanying photomicrographs in full color by Julius Weber.

There are some 14,000,000,000 nerve cells in your brain and spinal cord alone. Every nerve cell of your body is potentially connected with every other one, which goes to show how many personal possibilities must remain undeveloped. A typical nerve cell. or neurone, looks something like a careless ink blot. It has a relatively large cell body with a nucleus near its center. Extending out from it is a hairlike nerve fiber terminating in smaller rootlets. Dendrites, something like receiving antennae resembling the



Nerve impulses travel 155 miles an hour, so it would take 20 hours for our long-armed man to feel the pain of the bee's sting across the width of the continent —enough time for a jet plane to make two round trips.

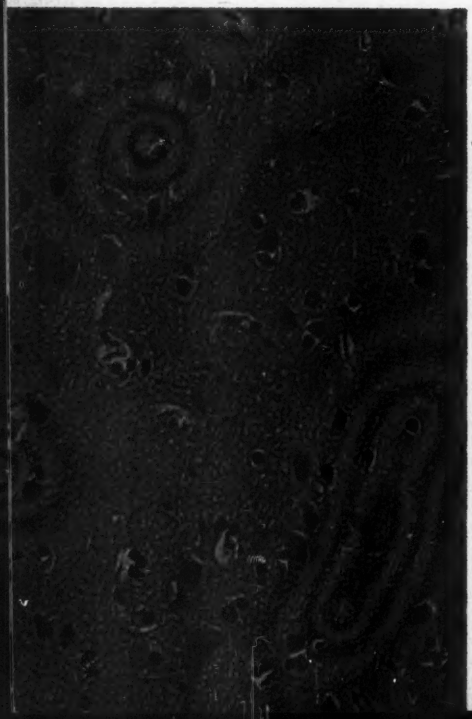
The criss-crossing nerve tracks of the brain stem. The very short lines are severed fibres.

fine roots of an upended tree, connect with the cell body and enable it to receive impressions. Greatly over-simplified, this is the basic unit that makes you tick and some millions of them are at work at this instant enabling you to convert black areas on this sheet of paper into intelligent meaning.

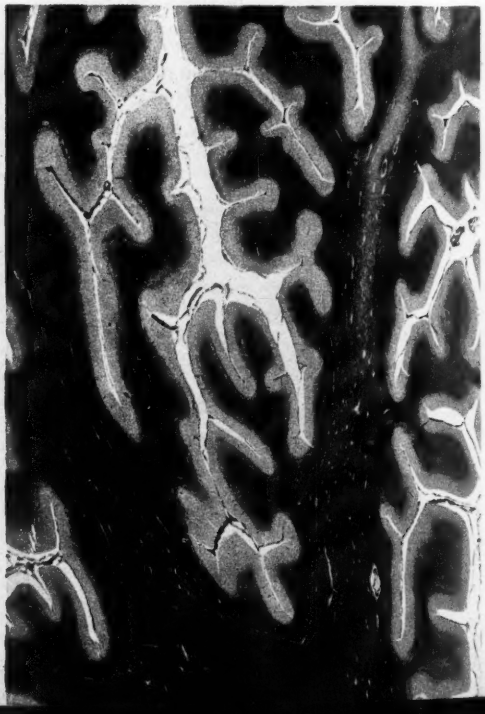
Sensory neurones collect stimuli from the outside world—a pinch, a flash of light, a sound wave—and conduct them (often with the aid of connecting neurones) to motor nerve cells that send activating impulses to muscles or glands. And in the cerebrum, the "thinking part" of your brain, cortical neurones make you aware of what's going on. You don't see light in your eye, feel a pin in your finger, or hear sounds in your ear—these sensations are completed in your brain. Yet your brain feels no pain, in itself. You couldn't feel a surgeon digging into your brain substance if he could get at it without opening your skull.

Numerous nerve fibers banded together like wires in a telephone cable constitute a nerve. Some individual fibers are a yard long. A nerve looks like a white filament because it is enclosed in a white sheath of

A photograph of the "mind"—the associating and "thinking" nerve cells of the cerebrum.



Cross section of the cerebellum showing the area where the coordination of impulses takes place.



Color photomicrographs by Julius Weber, Head of the Department of Photography of the Columbia-Presbyterian Medical Center

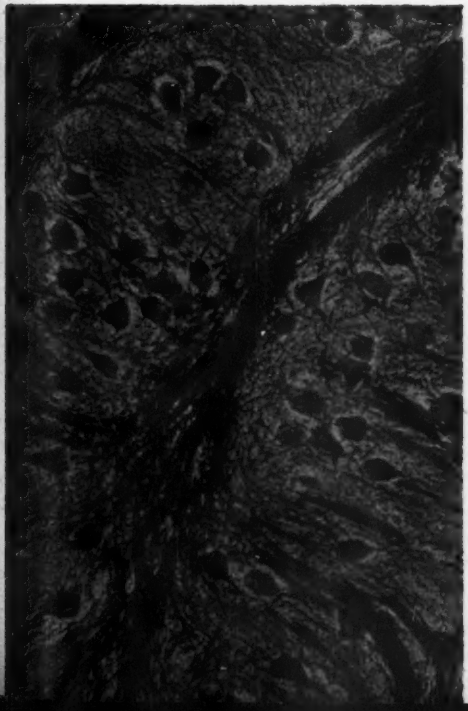
fatty material called myelin (though not all nerves are so insulated). The white matter of your brain and spinal cord is largely a mass of sheathed nerve fibers. The gray matter is mostly naked nerve cells and unsheathed fibers. At birth you had as many nerve cells in your brain as you do now. Increase in brain size results not from new cells but growth of existing ones.

You could function pretty well on a purely vegetable basis without using your higher brain cells at all. In your brain stem, a bulge at the top of your spinal cord, complicated nerve pathways influence many functions such as breathing, heartbeat, ability to stand, that you don't think of consciously. You blink at a bright light, jerk your hand away from a pinprick, through reflexes that accomplish 90 per cent of the work of your nervous system.

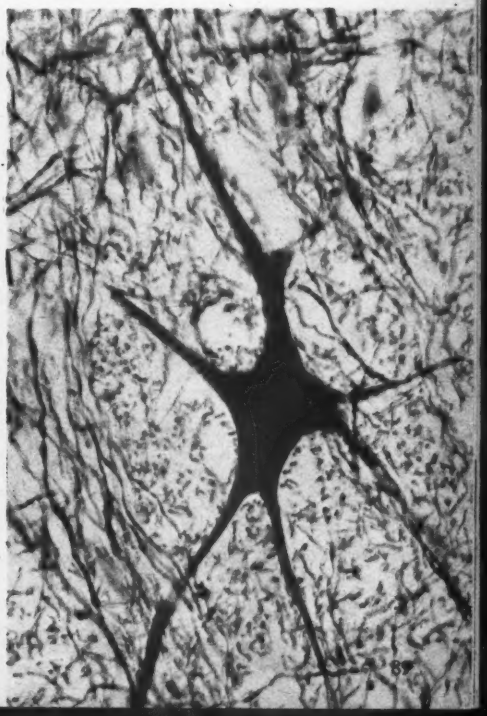
A familiar example is the patellar or knee-jerk reflex. Tap your dangling knee and sensory neurones [*Continued on page* 168]

These blood vessels of the brain give an idea of the tremendous supplies delivered constantly.

Section of the olivary body of the brain stem—the area controlling our walking and standing.



A motor nerve cell of the brain. It receives impulses and sends "orders" that move muscles.



Art on METAL

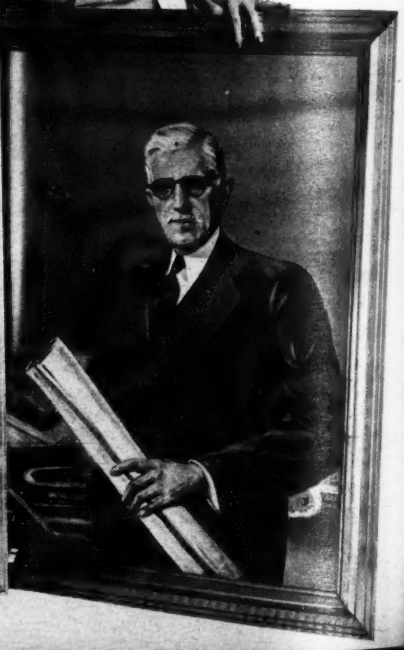
Paintings will live forever with this paint-on-metal technique.

WHILE other artists have been concentrating on form in their development of a modern, contemporary means of expression, Mrs. Buell Mullen has sought out new textures and materials. Dissatisfied with canvas, which has been used since the Renaissance, she decided to find something our age could give to the future with some assurance that the materials used would last for countless centuries.

The result is metal—stainless steel, aluminum, chromium, copper, even gold—which serve as background for her paintings. After several years of working with [*Continued on page* 166]

First step in painting on metal is to develop theme in detail, using paper and charcoal. Mrs. Mullen is shown above, with a sketch.

Mrs. Mullen with two finished portraits, both on steel. At left is Stefansson, famed explorer, and Dr. L. L. Odell, well-known engineer.

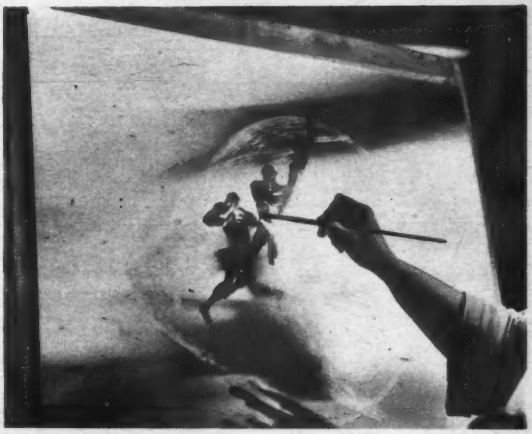


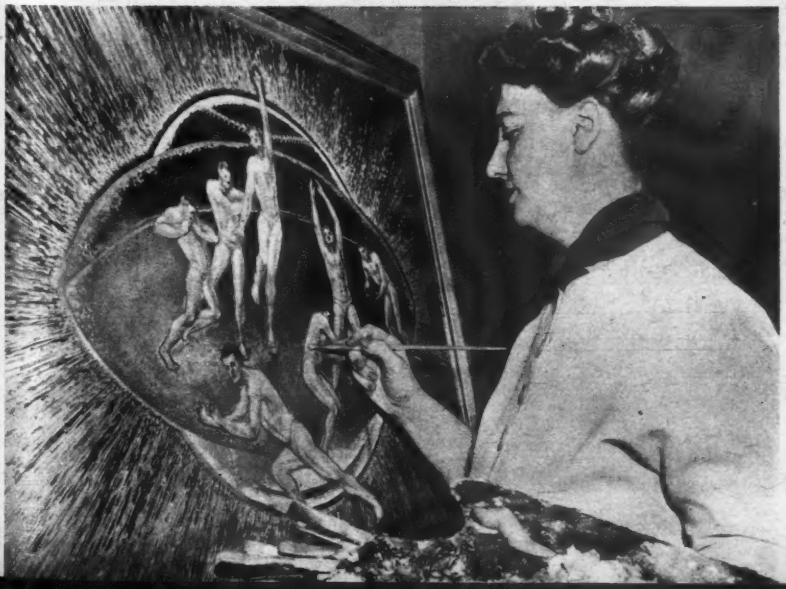
The second step, above, shows tracing paper with design fixed over sheet of metal. Design is cut through the paper onto metal with etching tools.

Third step, upper right, shows the areas to be painted over getting a "roughing" with diamond-pointed tool. Large areas are left smooth.

At right is the painting in its early stages. Figures are blocked in on the roughened surfaces of the metal, and general theme is developed.

Below, final form of painting is now visible. After completion, the painting will be "fixed" with a special varnish applied to all of the painted surfaces.





Easy does it, mister! A worker tenderly carries a pretty mannequin to the workshop. Below, mannequins' fingernails get a careful painting.

Primping the Plaster Gals

Combining the functions of doctor, beautician and hairdresser, this outfit has made a big-time business of dolling up the pretty dummies!

Photos by European Picture Service

Right, a dismantled mannequin takes a sandpaper facial without a whimper.

Below, a spray gun is used to put a new coat of lacquer on the legs.

Elaborate coiffure, like the one shown, is part of service.

FIVE years ago Florence and Gilbert Laurence put their touring puppet show in moth balls and turned their artistic and creative talents to a brand new business. The result was, and is, Madisonia, Inc., a combination hospital and beauty shop for mannequins.

Here the beautiful but dumb ladies who brighten department store windows from coast to coast are sandpapered, repainted, given new and stylish coiffures, bright new fingernails, eyelashes and any other make-up needed to catch the eyes of window-shoppers.

Most of the patrons of the service require beautifying because of old age or changing fashions but several have been damaged in hurricanes and shooting frays.

Circus Sound-Off

A boa constrictor and his pal, both big-top performers, hiss their best hiss for the little box.

WHAT animal makes the most noise?

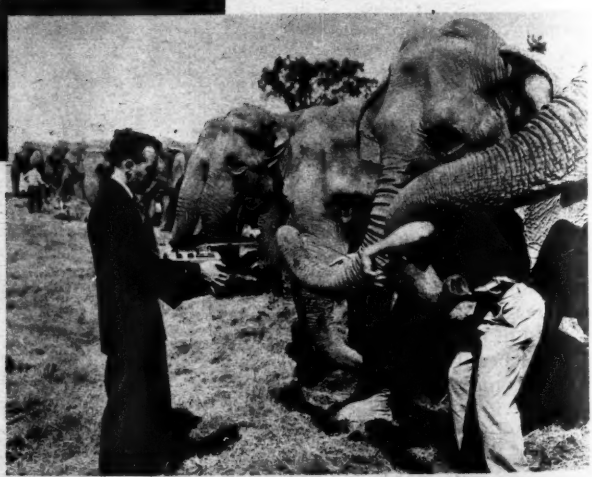
Somebody chased up to the circus to find out. (Nobody knows why.) He used a sound level meter, a device that measures quantity of sound in decibels. He'd stick the meter at their lips (or equivalent) and they'd be made to give out with the throat. Their score would be noted. It was very scientific.

First, to warm up the meter, he confronted the canary. The little fellow chirped a 77. This was very good. There was applause from the audience. A number of animals were tested, and all did about as well as expected. Then came Gargantua's turn—Gargantua, horrific gorilla, horrendous reminder of mankind's brutish past. Faces blanched, the crowd stood back. This most feared of all circus animals strained—grunted—and produced a 73. Only 73! Four less than the canary! Toto, his diffident but frightful girl friend, did no better. The crowd relaxed. The sissies! Razzberries for them!

Of course in his turn the circus barker was tracked down, cornered, made to bark.

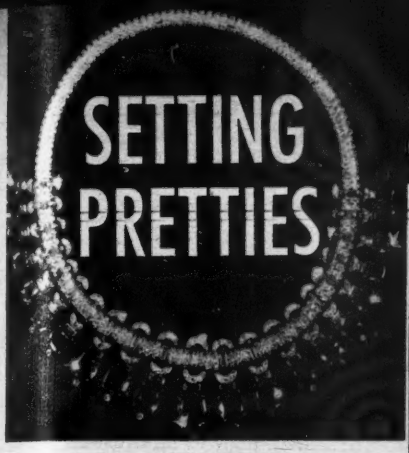
He did a 100! Only the lion and elephant topped him!

Gargantua is a strong and silent type. He scowls a lot, sneers sometimes, but the wee canary beats him!



The elephant is persuaded to trumpet. He's usually quiet, but his trunk is a mighty potent noisemaker.

SETTING PRETTIES



Beautiful jewelry is the product of painstaking labor and supreme skill.

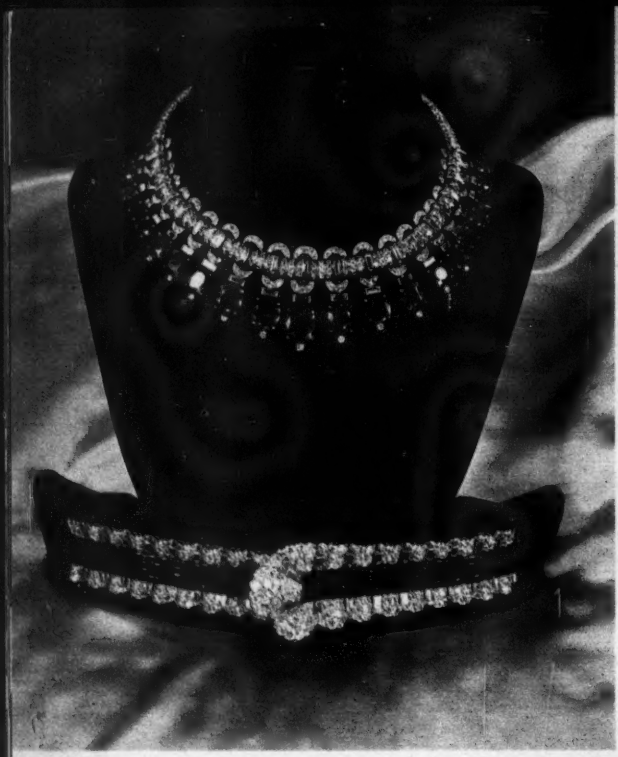
Hammering the metal into shape, at upper right, is one of the first steps in making fine jewelry. Above, the bracelet is shaped with a delicate saw after pattern has been pierced by a drill. Below, setting diamonds.

AROUND the world for hundreds of years, precious stones have been a symbol of riches and power. Discovery of a new, large and "perfect" diamond receives more attention than the birth of most babies. Crown jewels retain their value long after crowns have been lost.

Fine gems, however, shine most brilliantly in proper settings. And the setting which may have been right for a Victorian dowager's diadem is incongruous today.

The "diamond lace" bracelet which is traced in these photos from its birth in the designer's mind to the finished product, price-tagged at $25,000 in a Fifth Avenue jewelry store, represents a high development in the modern craftsman's art. Starting with an exclusive design, it took between 500 and 600 man hours of fine work, with specially-designed tools, to complete the diamond-set bracelet, with its detachable inner bracelet of matched rubies that can be worn separately.

The bracelet was made in the unromantic New York workrooms of John Rubel, a French jeweler who came to the United States from Paris a year before the war. In the workshop, craftsmen spend pains-



The finished bracelet with a companion piece, a $150,000 diamond and ruby necklace.

Kodachrome by Sid Latham

forced to give up his apprenticeship because he lacks the talent and physical attributes which only birth can give.

All craftsmen who work on a piece of jewelry are given a minutely exact drawing of the design. The stone-setter models the design in wax, which is lacquered to hold the framework in place during the setting. Then it goes through the various steps, illustrated by the pictures with this article.

The finished product, a thing of gleaming, sparkling brilliance, is ready to take its place in the showrooms of a jeweler and eventually enhance the beauty of the ultimate purchaser.

taking hours hammering and polishing, setting and filing, until pieces of unpolished metal and rough stones evolve as delicate works of fine jewelry. The majority of workers are French and their art has been handed down from father to son through the centuries.

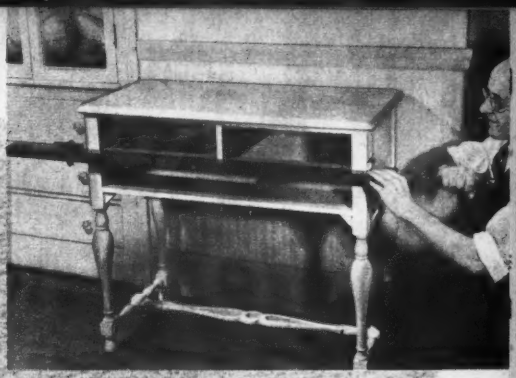
It is not uncommon for a novice, upon selecting the venerable craft for his life's work, to serve his apprenticeship under the tutelage of both his father and grandfather. During the first three years, he does little besides observing.

Experience alone does not insure mastery of this fine art. When tiny parts such as sections of the bracelet above are soldered together—usually with a mixture of gas and oxygen—the delicate hands of a surgeon are required. Often, an ambitious youth is

Final polishing of the bracelet is done by machine and with polishing agents after stones are set.

CABINETMAKERS' CLAMPS

Add these handy woodworking clamps to your shop equipment.



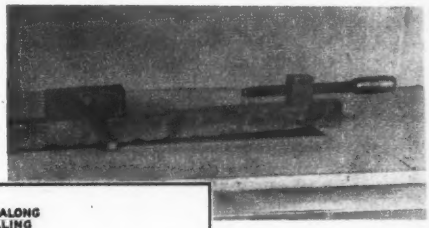
These clamps are indispensable for repairing cabinet joints or for furniture construction.

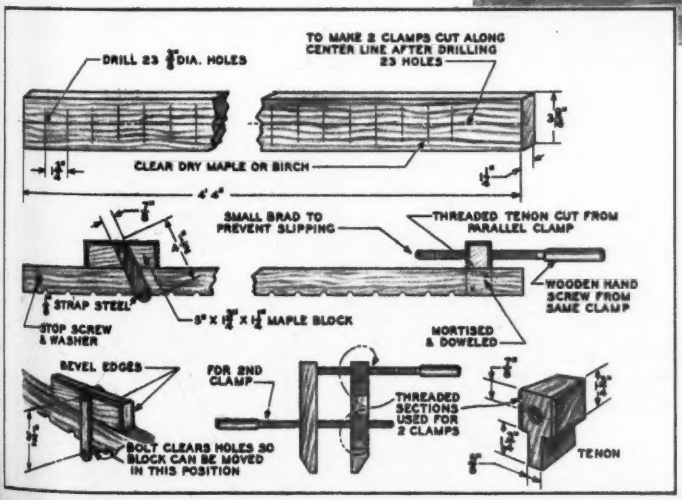
EASILY built from a few pieces of lumber and a 10-inch parallel wooden clamp, these cabinet clamps will find plenty of use in your shop and will cost you only a fraction of that of a ready-made pair.

First draw a center line on the rail stock and mark off 23 even divisions, as shown. Drill a 3/8 in. diameter hole at each point and then carefully saw the stock in half, through the hole centers. Next, cut the sides of the parallel clamp to form the fixed blocks for the cabinet clamps. The blocks are made into mortise and tenon joints, hot glue applied and two 3/8 in. dowels driven in side holes. As these blocks have holes already threaded for the hand screws, no further work on them is required. However, drill a small hole in the end of the hand screw to receive a brad, allowing a $\frac{3}{16}$ in. pointed tip to project. This will prevent the hand screw from slipping under pressure. Sand and brush on two coats of shellac.

The movable blocks are made from the two 5 in. pieces [*Continued on page* 144]

Two dowels hold the fixed block in place. Below: A finished clamp ready for your shop.





CRAFTS and HOBBIES

Jivin' up the Jeep

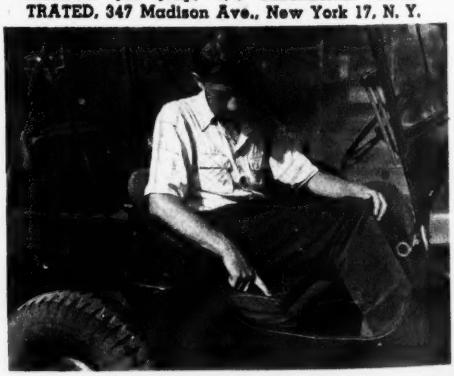
THOUSANDS of Army jeeps are hitting the roads these days as car-hungry ex-GI's take advantage of their status as preferred buyers of surplus Government materials.

After the buyer has given all the neighborhood kids rides and has explained the front-wheel drive and the double reduction gear box to their inquisitive pappies, he begins to remember something he shouldn't have forgotten in the first place; that the jeep was designed specifically for military purposes, and that it has serious short-comings as either a family conveyance or as a commercial truck.

Very fortunately, it is easy to convert the jeep into an altogether respectable automobile. Here are a few ideas that have proved practical. MECHANIX ILLUSTRATED invites its readers to submit similar suggestions. Good snapshots are desirable; sketches or drawings are also acceptable. For material that can be published, MI will pay good rates promptly on acceptance. If enough contributions are received they will be made into a regular department.

Address: Joe Jeep, c/o MECHANIX ILLUSTRATED, 347 Madison Ave., New York 17, N. Y.

TOP BRACES: The top is the most poorly designed part of the jeep. The center bow doesn't support the canvas; the canvas supports it! To prevent undue wear on the material, brace the center bow with pieces of angle iron bolted to the frame.



SOFT SEATS: Some jeeps have solid bucket seats, others thin spring seats. In either case you'll find riding easier if you purchase a set of thick foam "rubber" kneeling pads of the same dimensions as the seats. These will help absorb the roughness that is characteristic of all jeep rides. For summer driving, cover the seats with washable cotton cases.

Convert your Army jeep into a pleasure vehicle by adding a few gadgets the GI couldn't enjoy.

WINDSHIELD WIPER: Why the Army didn't equip jeeps with automatic windshield wipers seems to be a $4 dollar question. The intake manifold is already fitted for the air tube, so installing a Trico motor is easy. Extend tubing on outside as shown at right.

HOLD DOWN CLAMP: At idling speeds the hood rattles fiercely because it is clamped down only at the front end but not near the hinged end. A simple cure is to remove the useless hold-down clamps from the front end of the hood and mount as shown below.

IGNITION SWITCH: Most jeeps have a simple ignition switch, without locking means. If a regular car ignition lock is unobtainable, a padlock can be used. Mount an eyebolt in the dashboard against the switch and drill a hole for the lock yoke.

TAIL LIGHT: Save yourself a ticket by installing a 2 candle power lamp over the license plate before you drive at night. Connect the underground wire to one of the terminals intended for the trailer connections. Find the correct lead via trial and error.

snootie

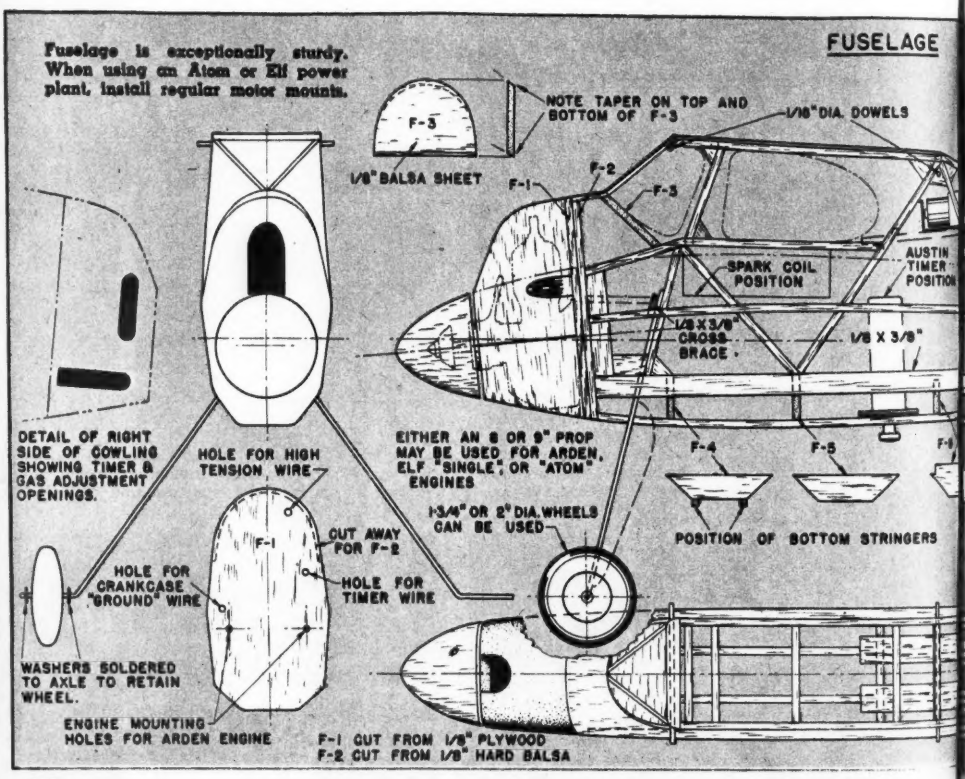
BY PAUL PLECAN

A realistic, super performing class A gas model designed especially for the Arden .099 engine.

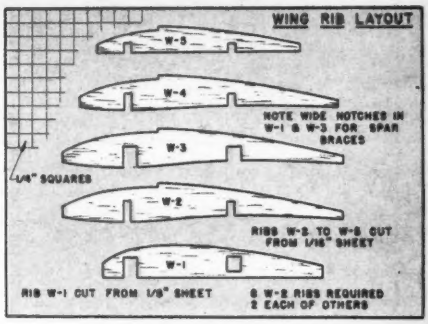
SNOOTIE will satisfy the most avid contest fan as well as the average model enthusiast. Designed and built especially for the hot Arden .099 engine, Snootie is both good looking and a potential contest winner—a combination rarely found at any field today. What's more, the job is easy on the budget and can be built in a hurry, due to the "planned simplicity" of the design. It will be noted that the model incorporates five degrees of down-thrust in the engine —a precaution against stalling under power. Most models wind up with down-thrust after a few test flights so we figured, in view of the terrific power the Arden packed, down-thrust would be necessary to obtain a high rate of climb without worrying about looping.

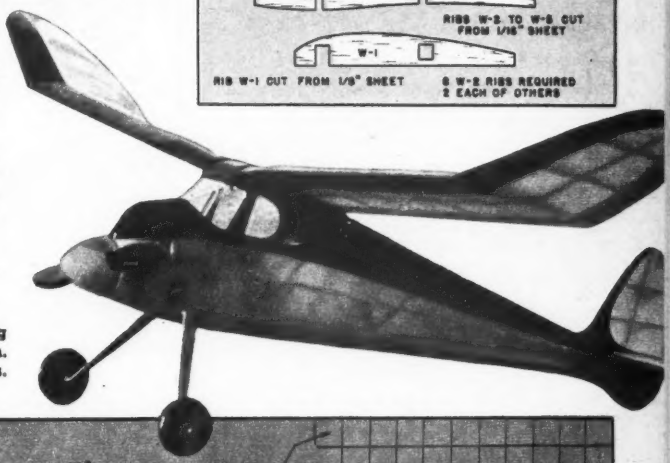
Before starting actual construction, enlarge the plans to full size or else contact the MI Reader Plan Service for actual size drawings.

FUSELAGE CONSTRUCTION: Using medium stock, assemble two sides of the fuselage directly over the plans. Note that small gussets are employed in certain areas where extra strength is needed. Once the cement is dry, remove the sides and split apart with a razor blade. The two sides can now be pinned down to the bench so the nose sections between F-2 and F-6 are 1¾ in. apart. Cement the forward cross braces in place and cut the

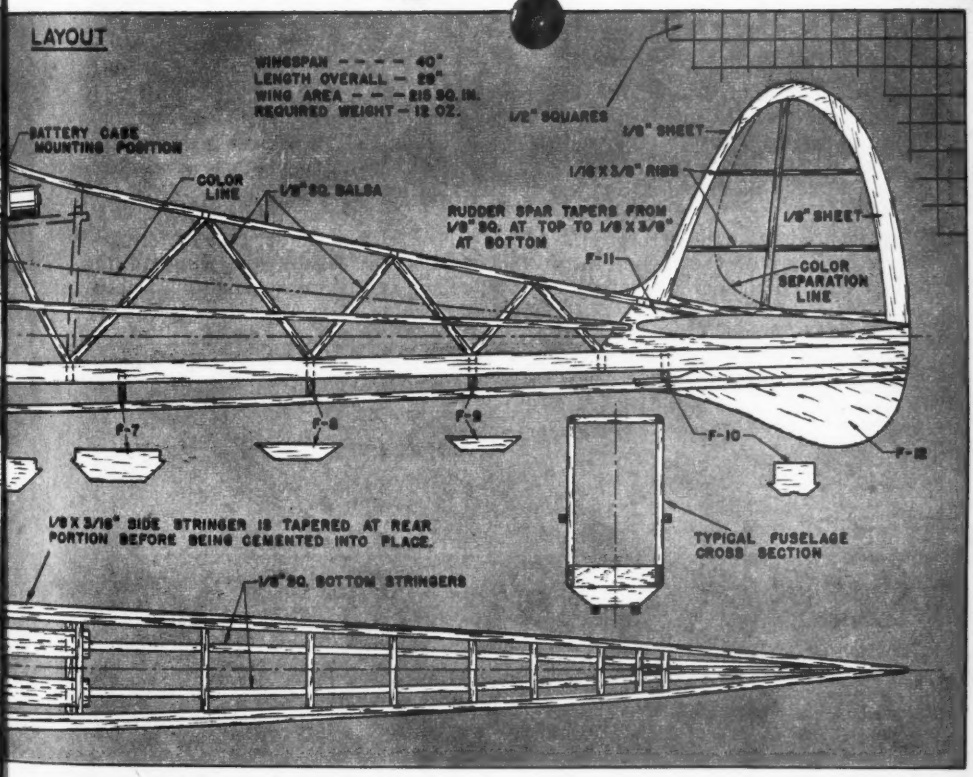


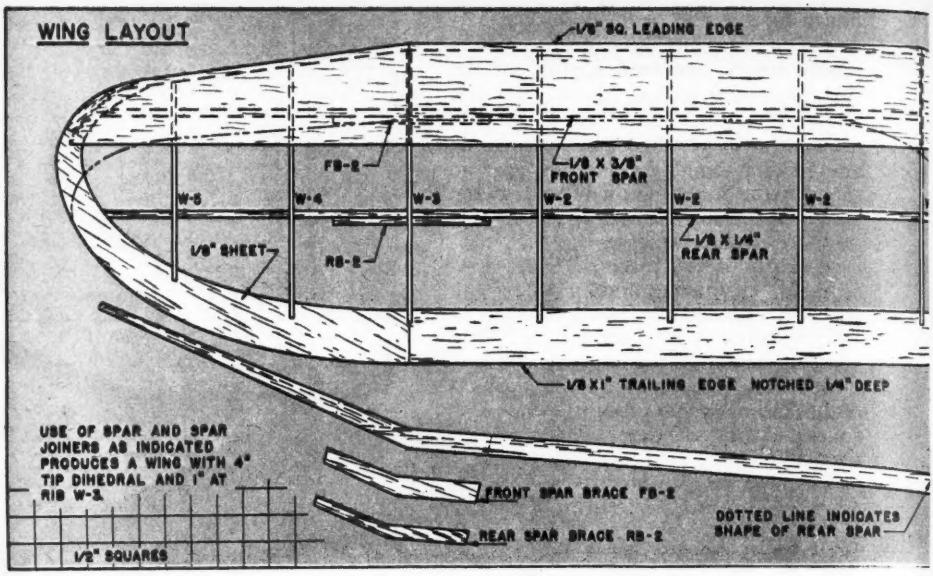
braces for the rest of the fuselage. The two side stringers and cabin roofing should now be cemented in place and the two dowels for holding the wing to the fuselage added. The formers F-4 to F-10 are next to be attached but before going any further, bend the landing gear to shape. After soldering the brace between each member, slip the wire in place and cement securely. Add a few pieces of 1/8 in. sq. bracing and proceed to cement the two bottom stringers in place after F-2 and F-12 are attached. The radial mount of the Arden engine makes installation extremely simple. Merely drill the holes in F-1, as indicated,





Cowl, spinner and gear fairing touch off the clean design. Weight is just up to AMA rules.

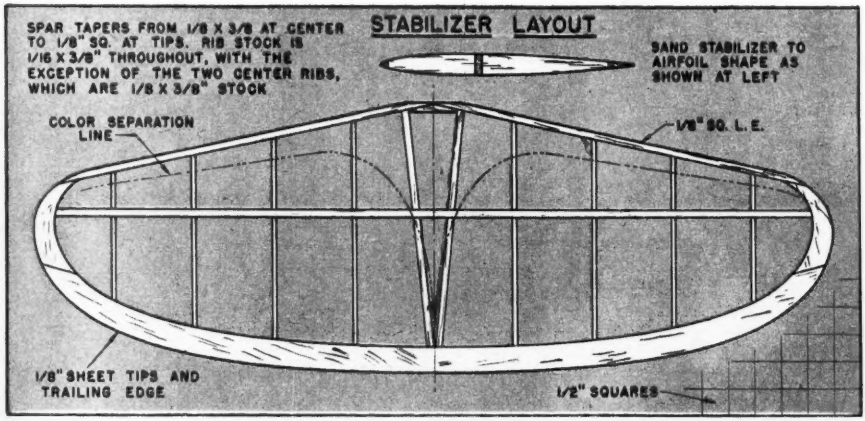


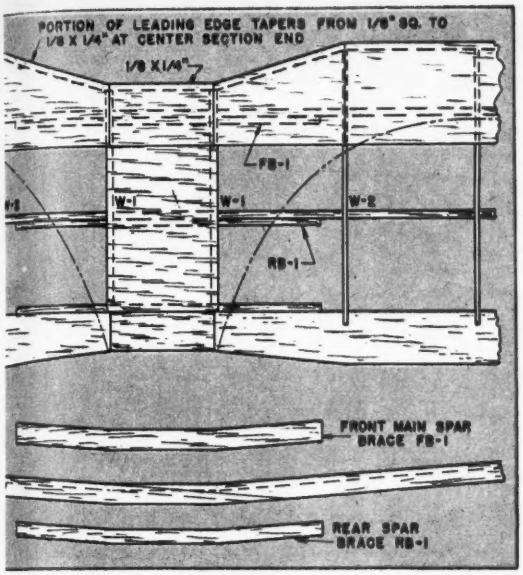


and cement the bulkhead against F-2. Extend the mounting holes through F-2 and cement nuts over the back of each hole for the mounting bolts.

Consistent performance of this model depends largely on the manner in which you wire the ignition system, so avoid engine trouble by doing a nice neat soldering job and by using short lengths of wire wherever possible. Use the hook-up recommended by the manufacturer and locate the various units as shown in the side fuselage view. If an engine other than an Arden is used, the coil and timer must be shifted for correct balance. When using an Atom, shift the coil and timer about 2 in. forward; if an Elf "single" is used, move the coil and timer back 2 in. This is necessary because the Atom is lighter than the Arden; the Elf slightly heavier. Correctly wired, you will get a good spark on the penlite alone, although you should use boosters for starting.

The Austin or similar type battery case is located just behind the wing trailing edge and can be moved slightly, if neces-

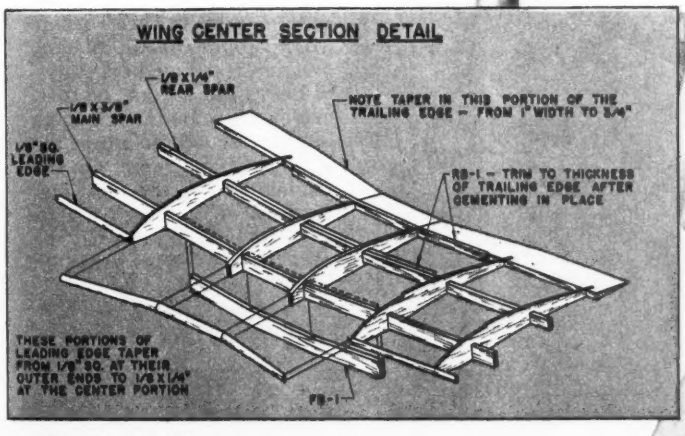


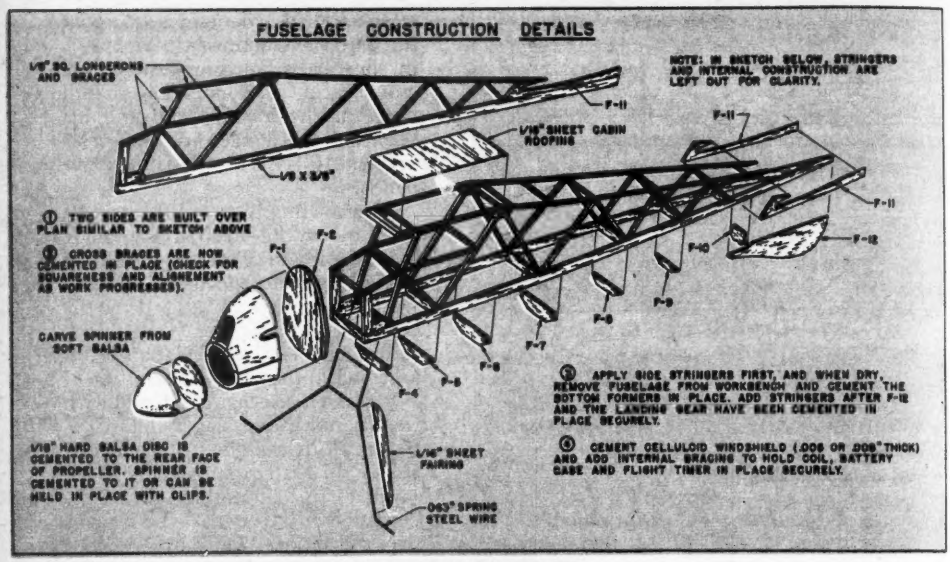


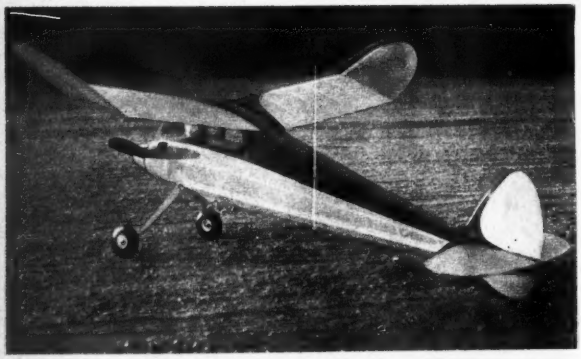
sary, for final balancing. Access to the batteries is gained through a 1/8 in. sheet balsa hatch set between the cross braces. The hatch has a cloth hinge at the forward end and fits between the longerons and cross braces. It is secured with rubber bands.

The cowling is carved from a soft balsa block 2 in. deep, 2¼ in. wide and 4 in. high. Trace or scribe the side view on to the block and cut just outside the line. Now draw the circle on the front of the block slightly larger than the spinner diameter and then trace the outline of F-1 on the rear. Carve to blend with the lines of the fuselage. Before going any further, cut up a batch of silk or tissue strips measuring about ½ in.x1 in. Dope these on to the cowling until you have two layers over the surface. Once dry, proceed

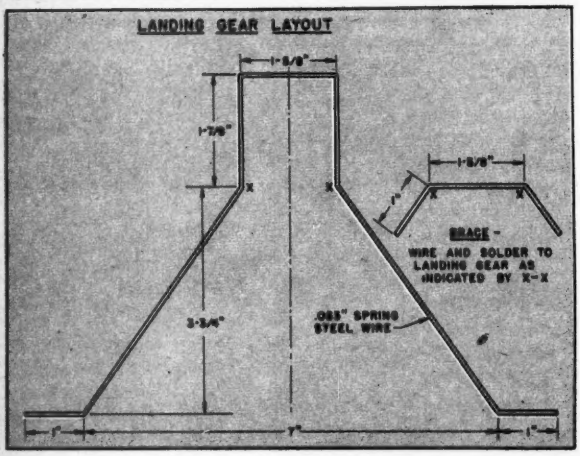
Stable and consistent, Snootie is a threat at any contest.







Ready for contest or sport flying. Climb is steep, glide slow and flat.



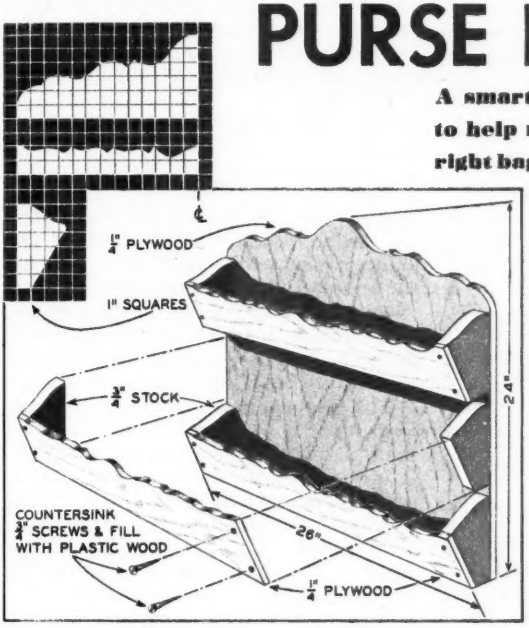
to hollow out the cowl. You will notice that the covering strengthens the cowl considerably. The sides should be left about ¼ in. thick; the top about ⅛ in. Cut two slots to permit access to the timer and carburetor controls and then cut out the two exhaust holes and the drainage hole on the bottom. The cowl is then cut in half and the lower half cemented in place. The upper sections can be held secure with rubber bands or any other accepted method.

The spinner can be best made on a wood-turning lathe but you can still do a neat job with a saw and razor. On the original model, the prop had a disc of $\frac{1}{16}$ in. sheet balsa cemented to the face, with the spin- [*Continued on page* 146]

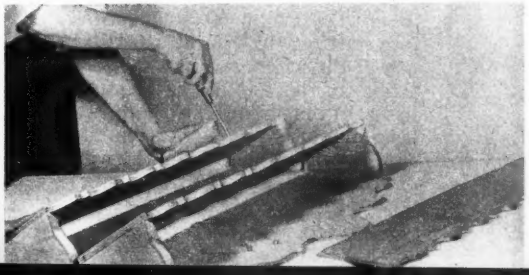
FULL-SIZED PLANS
are available. Turn to page 133

PURSE RACK

A smart closet accessory to help milady choose the right bag for her ensemble.



Patterns for shelves and back are for top curves only. Below: Fastening the parts together, prior to finishing



SHOE bags and hat stands are fairly common accessories in the average woman's closet. Yet for some strange reason, no one has thought to provide a convenient holder for the large and numerous bags which are used today. The rack pictured above fills this need at very little cost.

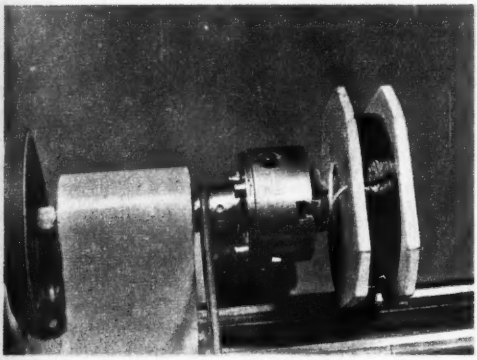
As most of the construction details are given in the drawing, very little additional information is required. In using the patterns for the shelves and back, remember that these are for the decorative curves only. Actually, the shelves are 5½ in. high and the back 24 in. high. In laying out the parts, you will save time and precious plywood by making full-size patterns for all of the pieces. After these have been cut to shape, they should be carefully sanded before assembling. The completed rack may be painted and decorated.

tool degausser

Patterned after the anti-mine device of World War II, this handy shop aid demagnetizes tools and parts.

BY HAROLD P. STRAND

Demagnetizing a screw driver. Work held in a magnetic chuck can be similarly treated.



Coil half wound. Note leads at the side of form. Below: Tying coil after form is dismantled.

ONE of the most annoying jobs in the home workshop is to use a tool or small machine part that has become magnetized. If it is a screw driver, the screw sticks to the blade making it almost impossible to start, especially in close quarters. This same magnetism also causes the turns of a watch spring to stick together making the timepiece run fast or slow.

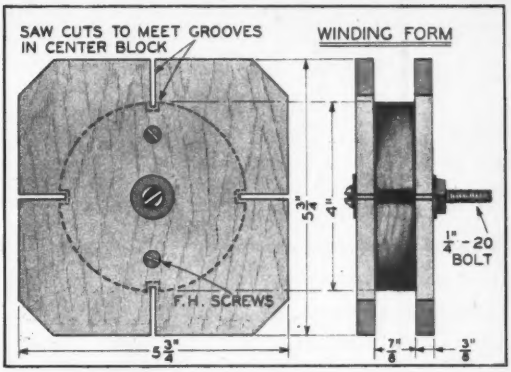
This bugaboo of tools and watches can be eliminated by using the tool degausser or demagnetizing coil shown in the photos. In operation, the device is plugged into any 110 volt A.C. outlet and the magnetized tool, watch or small machine part passed through the coil where the alternating field completely demagnetizes it. Because of the large diameter of the coil, a small box of machine parts can easily be passed through and the magnetism quickly removed from them.

The first step in building the degausser is to make a wooden form for winding the coil, following the dimensions and details in the small drawing. Four grooves are cut in the center block for the strings that hold the coil together after it has been wound. Corresponding saw cuts are made in the sides so the strings can be tied before the form is dismantled.

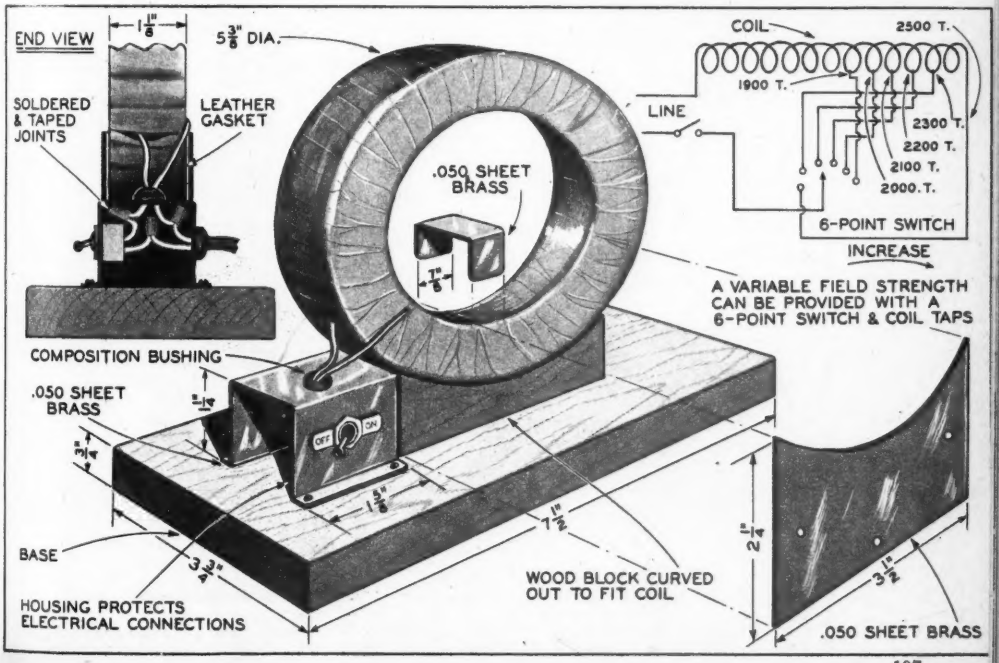
With the form chucked in a lathe, a strip of stiff fibre is first wrapped around the form as a base for the coil. The winding itself consists of 2,500 turns of No. 28 or No. 30, enameled magnet wire. Before starting, solder a flexible lead to the end of the wire and bring it out through a hole in the side of the form as shown in one of the photos. In winding the coil, keep the turns uniform and put a reasonable amount of tension on the wire. Some

method of counting the turns should be used to avoid errors in winding. At the end of the 2,500th turn, cut the wire and solder a flexible lead to the end, bringing this out through the side of the form. In removing the enamel, use sandpaper instead of a knife which might knick the wire and cause a break later on. Fasten the lead to the coil by means of a piece of Scotch tape.

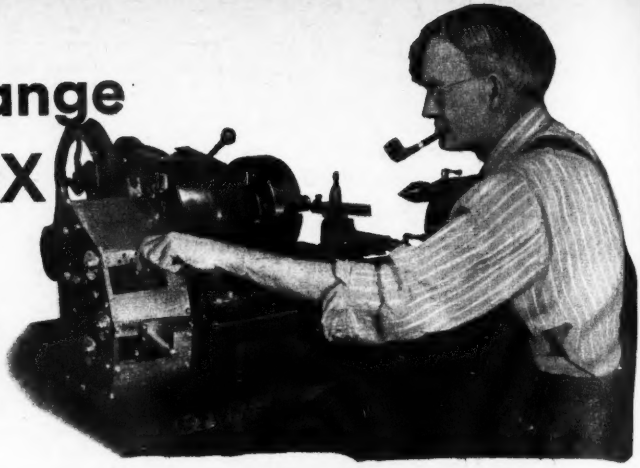
The winding form is removed from the chuck, four strings passed through the grooves in the center block and the coil tied up. The form is then dismantled and the coil shaped with the fingers to make it as square as possible. Next, wrap the coil with cotton tape or fabric type scotch tape and give it several coats of shellac to stiffen and insulate it. Don't use ordinary friction tape for the covering, as the adhesive on this won't take paint satisfactorily. Follow the shellac with two coats of lacquer or enamel to finish the [*Continued on page* 146]



Wooden form used to wind coil. Sides are removed later. Below: Attaching sides to base. Finished coil on right.



Quick-Change GEAR BOX



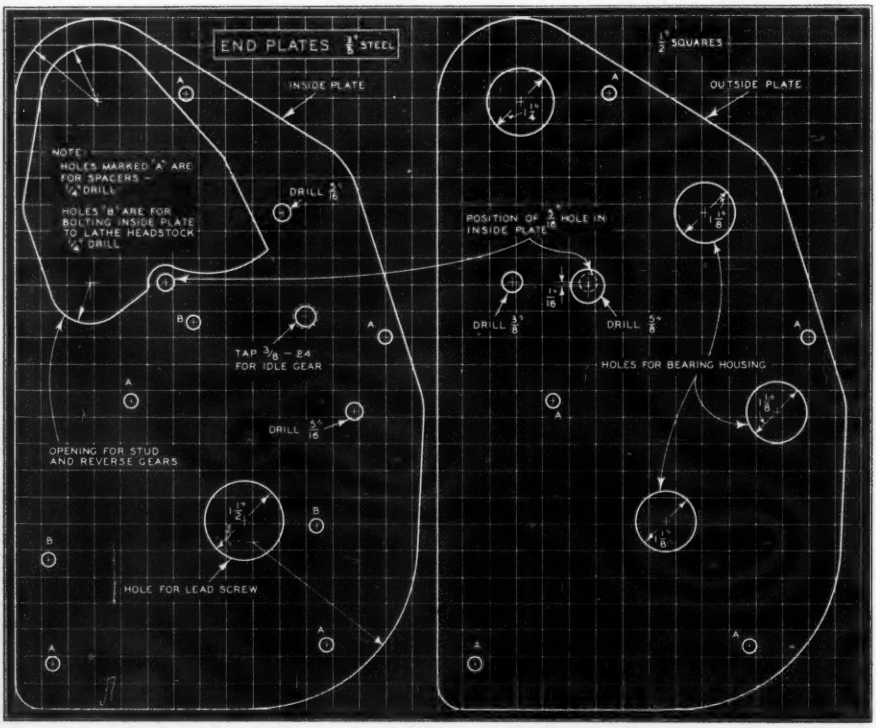
A lathe attachment that will enable you to choose any one of 56 feeds instantly.

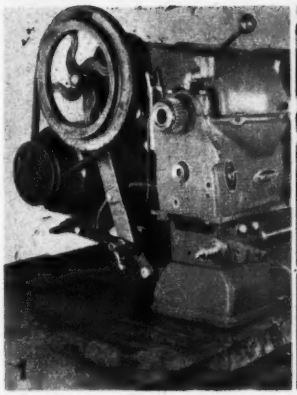
BY B. F. LAWRENCE

ONE of the most useful attachments for the popular priced small lathe is a quick-change gear box. It is easily constructed and, with slight changes, will fit most of the small lathes now on the market.

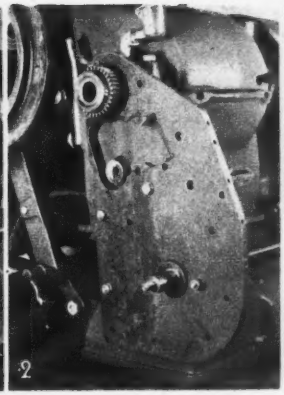
At a first glance, this project may appear a bit complicated but in reality is very simple. Careful study of the drawings and photographs should make the construction clear. Castings are not required and all work can be done on the lathe itself.

In addition to your regular threading gears, you will need seven more 32 tooth gears and six compound stud gears.

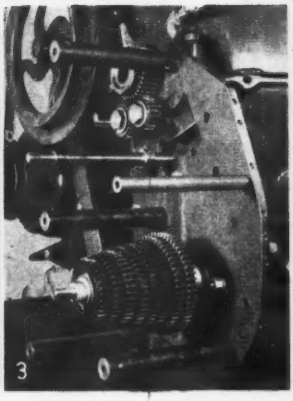




Original threading gears and cover are first removed.



Inner plate of gear box is held secure with four bolts.

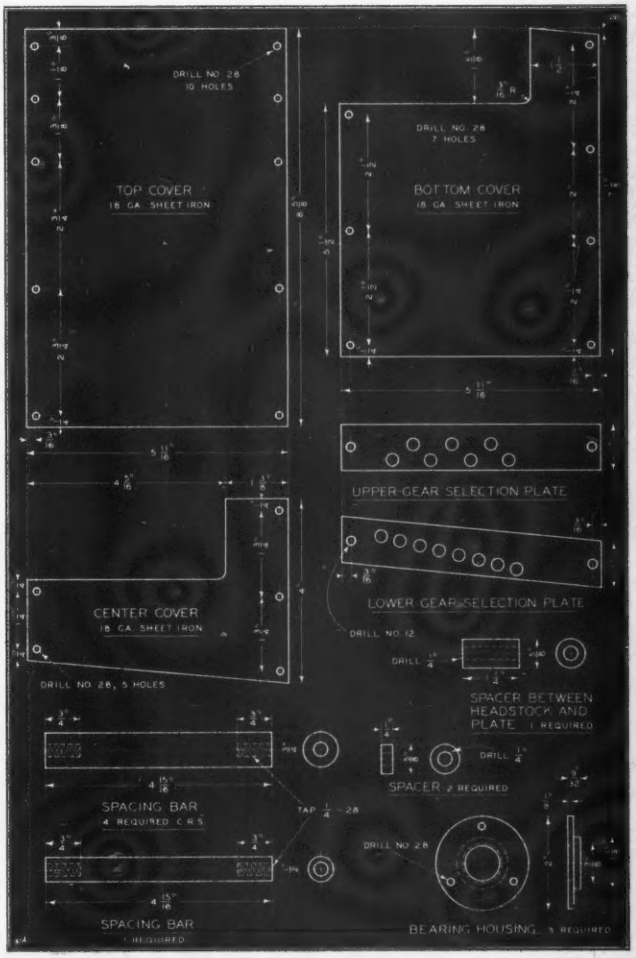


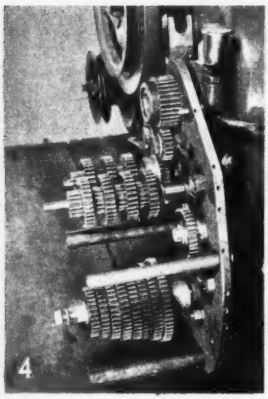
Eight gears are mounted on the lead screw shaft.

Bronze bushings may be used throughout instead of the No. S 3 ball bearings.

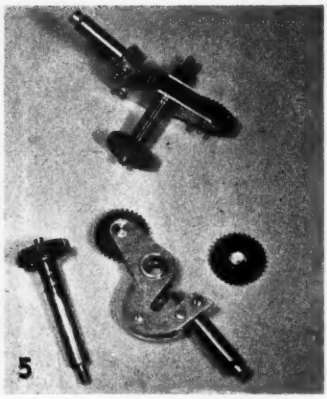
The two end plates are cut from 3/8 in. thick steel. Four 1/4 in. bolts tapped into the headstock hold one plate securely to the lathe while five steel spacers tie the two plates together.

The stud, on which the reverse lever pivots, is fitted with either a ball bearing or bronze bushing to carry the stud extension shaft. Turn this shaft as shown on the drawing and then press a 32 tooth gear on the large end. The other end carries three compound gears, one of which is keyed as shown. On another shaft are four, free running, compound gears set directly in front and in mesh with these gears. Note that one end of this shaft is turned eccentric, while the other end is fitted with an eccentric bushing. This arrangement is followed throughout and makes possible proper align-

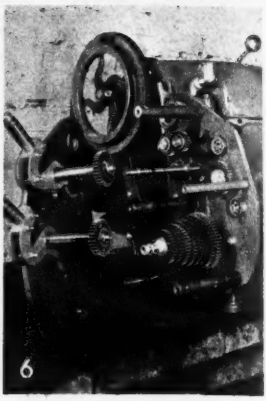




After all the gears are in place, add the outside cover plate.



The two built-up selector handles are of very simple yet rugged construction.



Five spacer bars hold assembly together. Note selector handles.

ment of the gears. It will be necessary to turn an extension shaft for the lead screw upon which are keyed a 32, 36, 40, 44, 46, 48, 52 and a 56 tooth gear. The lead screw is not altered as this shaft merely slides over the key on the end.

Next, turn the sliding gear shafts from ¾ in. diameter cold rolled steel. Mill the $\frac{3}{16}$ in. keyways and then key a 32 tooth gear onto the end of each. The remainder of the key slot serves to drive the sliding gears. The lower shaft is driven by the upper one through a bushing bolted to the inner plate.

The sliding handles consist of two ⅛ in. thick side members bolted at the back to a ½ in. steel block into which the plunger assembly is pressed. The opposite end is bolted to an eccentric bushing on which the pick-up gear turns. Bronze bushings carry each assembly on its shaft.

Bolt the two gear selection plates in place and locate the holes for the plunger by placing the pick-up gear in mesh with each gear with about three thicknesses of paper between them. Drill through the handle with a ¼ in. drill at each position. The holes in the upper plate are numbered 1 to 7 from right to left. The lower ones are lettered A to H from left to right.

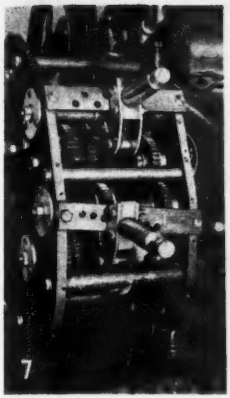
Cut the cover plates from sheet iron and fasten in place with 10-32 screws or bolts. The feed chart may be stamped directly on the top cover plate or on a separate piece, riveted on.

The chart below is for lathes having 8 threads per inch on the lead screw. If other than 8 threads—12, we'll say—just use 12 at the first number in the second

THREADS PER SPINDLE REVOLUTION

	A	B	C	D	E	F	G	H
1	4	4.5	5	5.5	5.75	6	6.5	7
2	8	9	10	11	11.5	12	13	14
3	16	18	20	22	23	24	26	28
4	32	36	40	44	46	48	52	56
5	64	72	80	88	92	96	104	112
6	128	144	160	176	184	192	208	224
7	256	288	320	352	368	384	416	448

Unit on an Atlas. Feeds can be changed without stopping lathe.



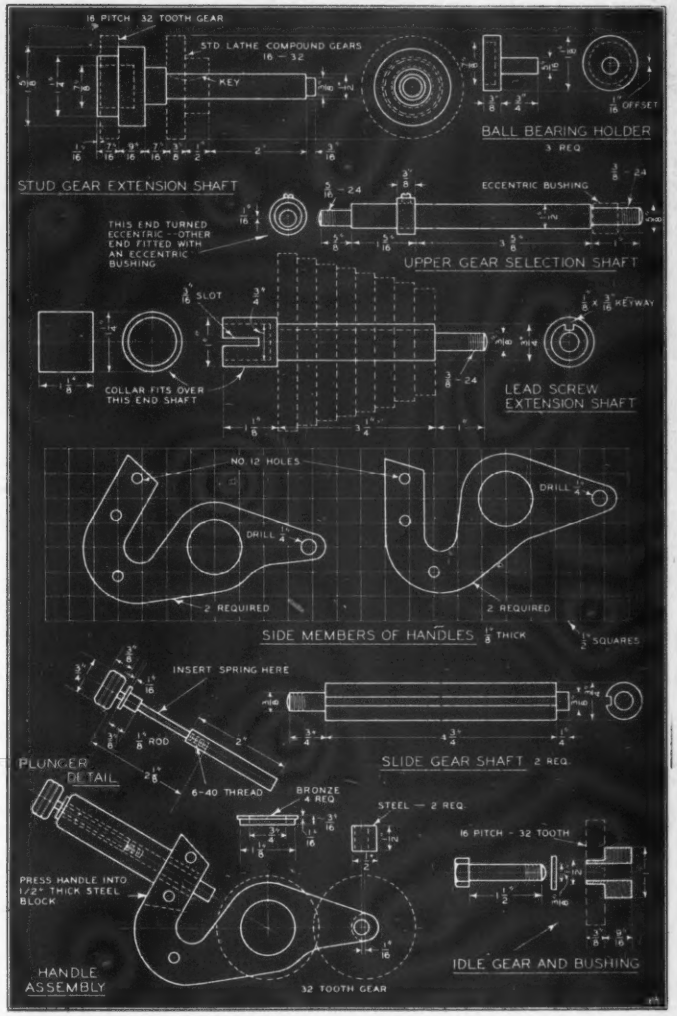
The completed gear box with cover plates removed.

row followed by the next seven numbers following the 12 on this chart. Half each of these numbers for the top row and double for each row below.

The chart in the lower right hand corner of this page shows the feed in thousands per spindle revolution, and greatly facilitates coil winding.

The original gear box was designed and built for a 10-inch Atlas lathe (shown in the photos) and compares favorably with the commercial units now on the market selling for slightly less than one hundred dollars.

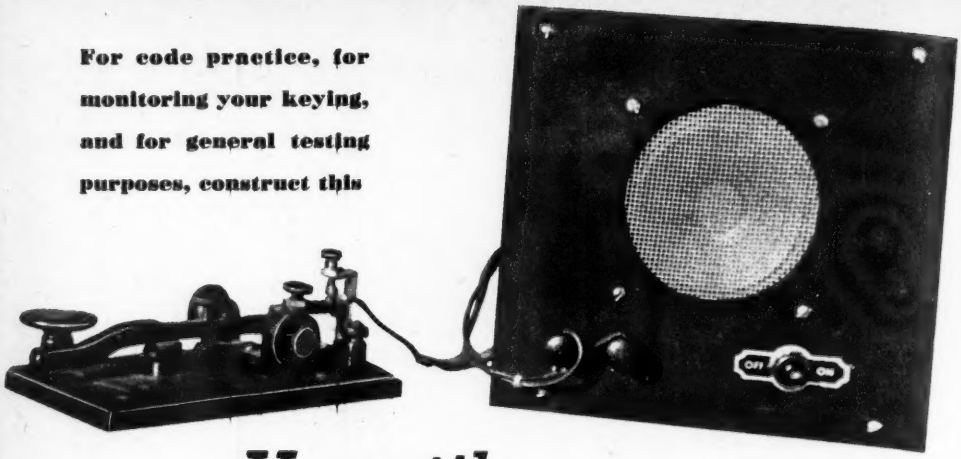
The gears comprising the major part of the box are standard equipment and can be purchased from the lathe manufacturer. All stock is easily obtainable from any metal supply house, large hardware store or machine shop.



FEED PER SPINDLE REVOLUTION

	A	B	C	D	E	F	G	H
1	.250	.222	.200	.182	.174	.167	.154	.143
2	.125	.111	.100	.191	.087	.083	.077	.071
3	0625	.055	.050	.045	.043	.042	.038	.036
4	.031	.028	.025	.023	.022	.021	.019	.018
5	.0156	.014	.0125	.0114	.0108	.0104	.0096	.0089
6	.0078	.007	.0063	.0057	.0054	.0052	.0048	.0045
7	.0039	.0035	.0032	.0028	.0027	.0026	.0024	.0022

For code practice, for monitoring your keying, and for general testing purposes, construct this



Versatile audio oscillator

By CLINTON CLARK, W1KLS

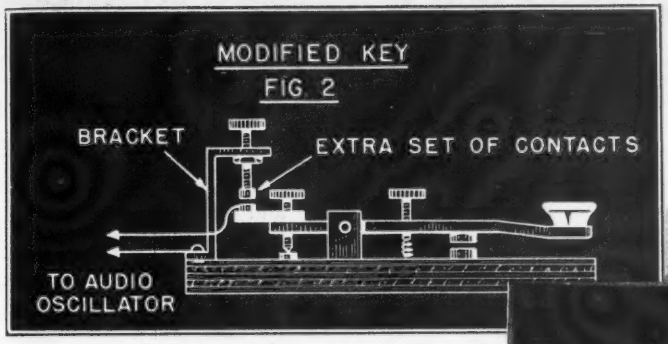
FROM the beginner's workbench in radio-electronics to the most modern up-to-date laboratory, the audio oscillator will be found a dependable piece of equipment that is used very frequently. It provides audio voltage for code practice, for tone modulation of transmitters on the higher frequencies, and for monitoring hand keying. In the modern electronic laboratory it is used for lining up audio amplifiers; as a voltage source for measuring devices such as bridges; and as a tone modulator for radio-frequency signal generators.

We are presenting here an oscillator which is simplicity itself. It does not even require a filament transformer. In the construction of the unit it will be noticed that economy has been the keynote throughout. The circuit is simple and uses parts that should be found in even the beginner's workshop. With reference to the circuit diagram, Fig. 1, it should be noted that parts were used which happened to be available. In the power supply section, a double twenty mfd. 150 v. capacitor C1 is shown for filtering purposes. If the individual's junkbox provides a double 10 mfd. unit or a double 8 mfd. or even a single section 8 mfd., these can very well be used to good advantage, since no great amount of filtering is necessary. Similarly, other substitutions may be made at the discretion of the individual.

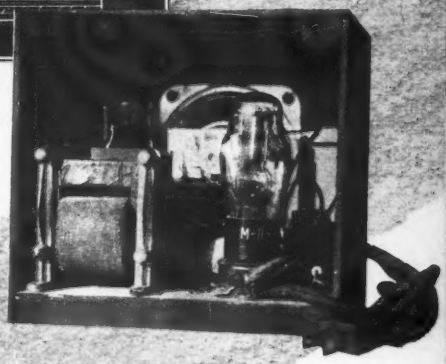
Almost any combination of 6.3 volt tubes may be employed if due regard is made for the current demanded by the filaments. It is easier of course to use two tubes which use the same current, such as the two 37's or 76's, otherwise some provision must be made to shunt some of the current past the tube drawing less than the other. If desired, pentodes may be used if they are connected up as triodes.

One other option is fairly obvious and that is about a speaker. Many times the junkbox will render up an old magnetic speaker which is still good. This may be put to use by substituting it for the output transformer primary, and then the key must be in series with it.

In the construction of the unit, a piece of pine board 5½x6 in. was utilized as the baseboard. Masonite was used for the panel, sides and top. The panel is 6x6¾ in., the sides 6x5½ in. and the top is 6x6¾ in. Two small blocks ¾x¾x-4½ in. long were used to secure the sides to the top. For assembling ¾ in. No. 8 roundhead wood screws were used. The box was assembled and then all exterior surfaces were given a coat of flat black enamel. This dries rapidly and provides



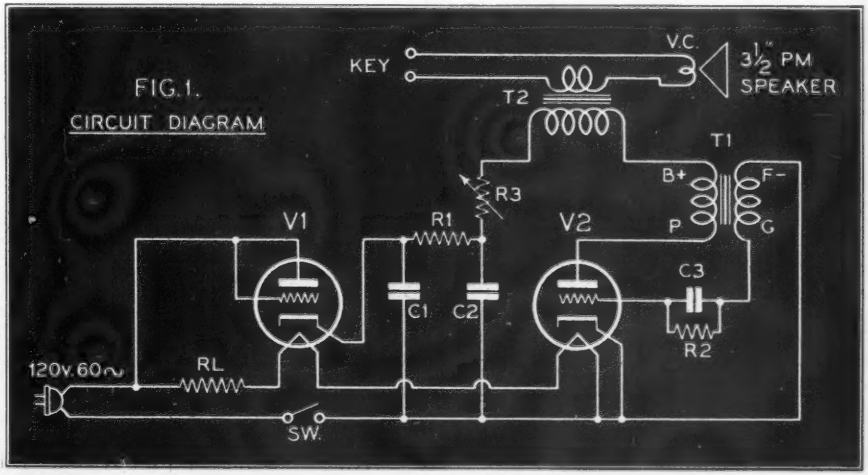
Left: With this modified key, you can check your sending. Below: Inside view of the oscillator.



a professional finish. A 3 in. hole is cut in the approximate center of the front panel to accommodate the 3½ in. permanent magnet speaker and this opening is covered with galvanized screen cloth. Two binding posts are mounted in the lower left corner and the off-on switch is mounted in the lower right corner. As to the layout of the interior parts and the wiring, no specific arrangement need be followed since placement of the parts will not affect operation.

The circuit diagram is simple. The question might arise as to why the key is put in series with the speaker voice coil rather than in the cathode lead or high voltage lead. It was found that key clicks were troublesome when the oscillator was keyed at either of these two places. To eliminate the necessity for providing additional parts to filter out these keyclicks, we put the key in the voice coil lead and this was very satisfactory. No clicks were heard when a small broadcast receiver was operated on the table beside the oscillator.

When wiring is completed as per the circuit diagram you are ready to put the oscillator into operation. Connect a key across the binding posts and plug the line cord into a convenient outlet. If when the key is closed no sound is heard, reverse the connections to either primary or secondary of the [*Continued on page* 148]



Ornamental Balance Scale

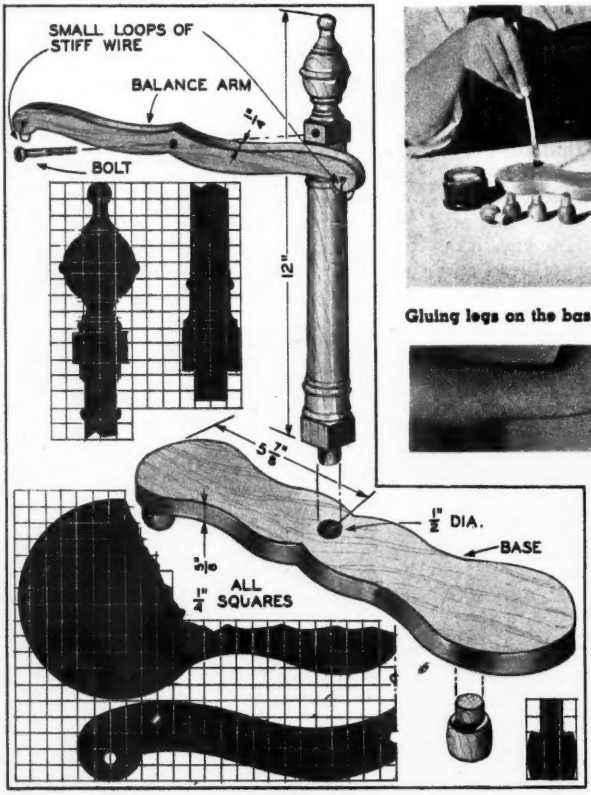
Add a period touch to your home with this quaint plant holder

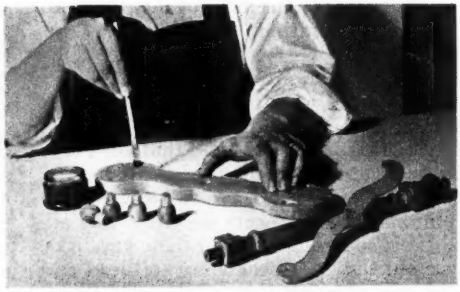
A PLEASING combination of beauty and utility, this copy of an old-fashioned scale is a perfect setting for plants.

The base and balance arm are made first by jigging them out of scrap hardwood. In drilling the hole for the post or vertical member, a try-square is used to get it perpendicular to the base. The holes for the feet are then drilled about halfway through the base from the underneath side.

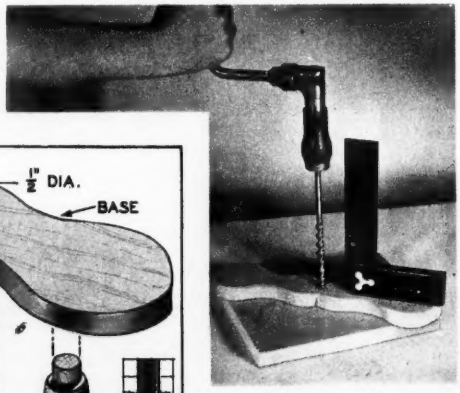
The next step is to turn the vertical member and the four small feet. After this, all the parts should be given a thorough sanding, assembled and finished by staining and varnishing. Small brass ashtrays are then suspended by chains from the balance arm to hold the house plants.

—Bertram Brownold



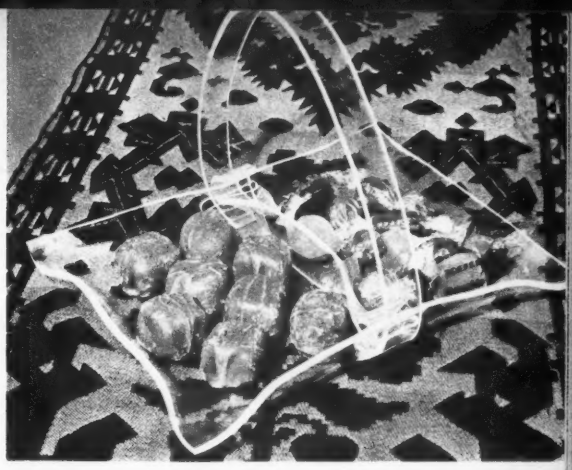


Gluing legs on the base. Balance arm and post to right.



Using a try-square as a guide in drilling hole for the post.

PLASTIC BASKET

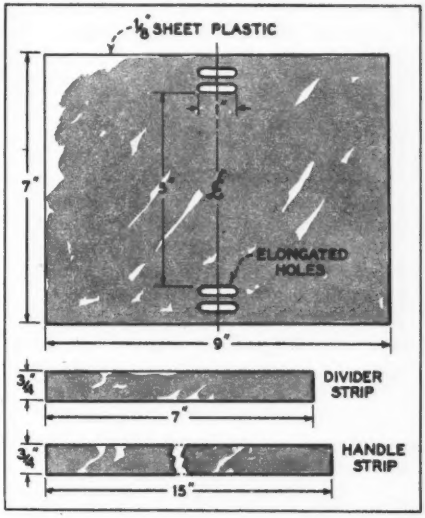


The finished product is the equal of expensive giftware sold in stores.

CRYSTAL-CLEAR plastic formed in a simple yet graceful design makes an ideal holder for candy or other tidbits. Best of all, the basket can be molded by hand and assembled in a few hours.

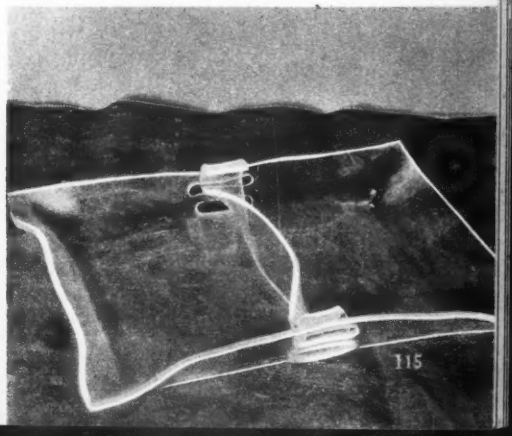
Three pieces of sheet plastic should be cut according to the drawing and elongated holes made in the largest piece. The divider and handle fit into these. A block of 3/4 in. wood, 3 in. by 5 in., is made for bending the body to shape.

The large piece of plastic is heated in the oven at 250 degrees until it is pliable. Lay the wood block in the center of the sheet and, using cotton gloves, bend up the four sides around it, pulling out the corners and pinching them. Do this quickly as the plastic sets very rapidly. If the finished shape isn't right reheat the plastic and bend it over again. The divider strip is heated next and bent to shape inside the basket as shown. Follow this by heating the handle strip and bend it to shape, following the method shown in the photo. Spring the ends of the handle apart and slip them in the slots.—*Elma Waltner.*



Divider strip in place and twisted upright. Edges of basket may be stained.

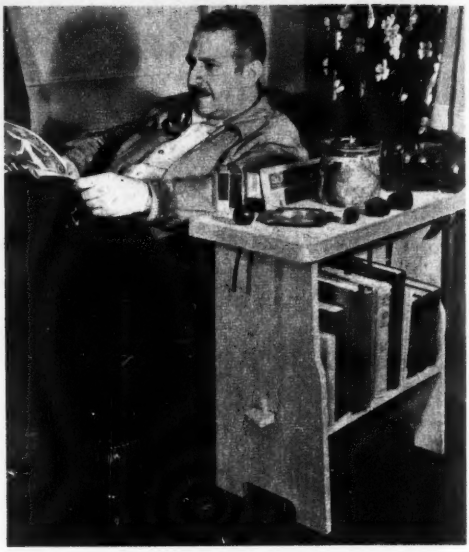
Method used to bend the handle to shape. Spring tension holds it firmly in place.



Smokers book table

BY PAUL H. GORDON

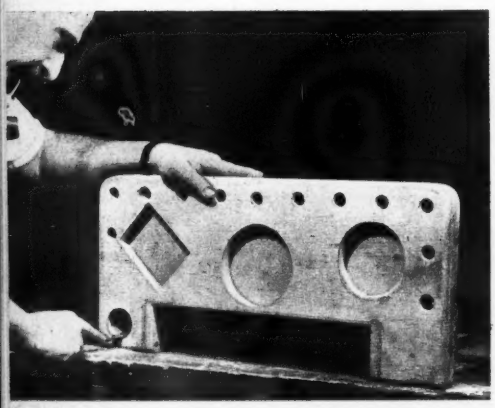
Park this convenient table at your favorite chair and relax with your pipe and a good book or magazine.



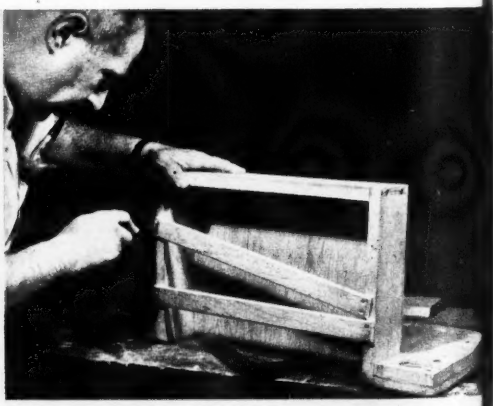
IF YOU'RE tired of hunting for that special pipe or the magazine you meant to read, then you're the man for whom this table is intended. The top is recessed for your pipes and smoking accessories and there's a handy rack for magazines at the side.

The construction is simple and whether you use a clear pine for easy working or a hardwood for appearance, it shouldn't take you more than a few evenings to finish. All material used is ¾ in. stock.

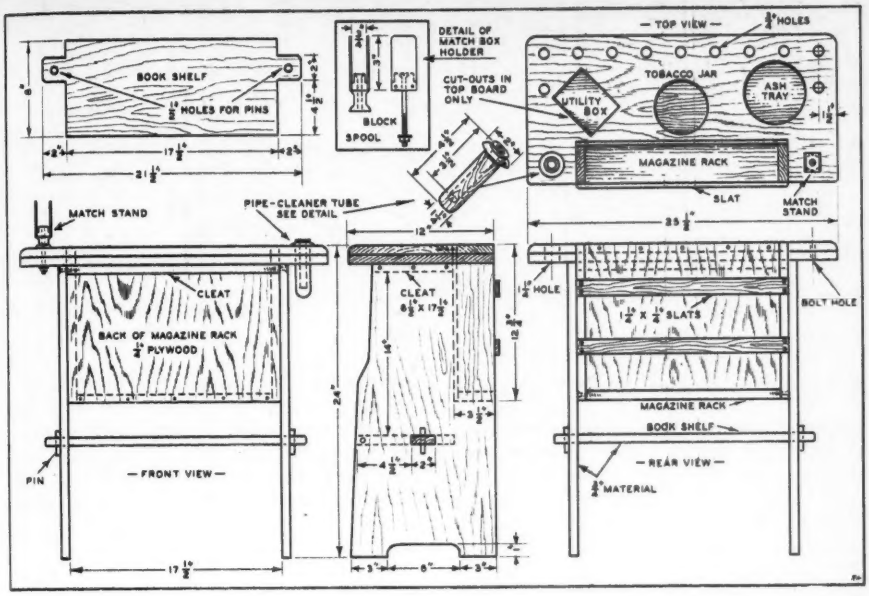
The initial step is to cut the two pieces for the top, following the drawing for size. Don't use this to cut out the upper piece for the tobacco jar, utility box or ash tray, but measure the openings for these directly from the accessories you plan to use. With the openings cut out for these, glue and clamp the two pieces together and drill holes through both for your pipes. Next, turn the pipe-cleaner tube and then make the match-box holder to fit a particular size of safety-match box. Follow the drawing for the details of these and when they're finished, drill holes



Finishing the top of the table. Note that openings for accessories are cut in upper piece only.



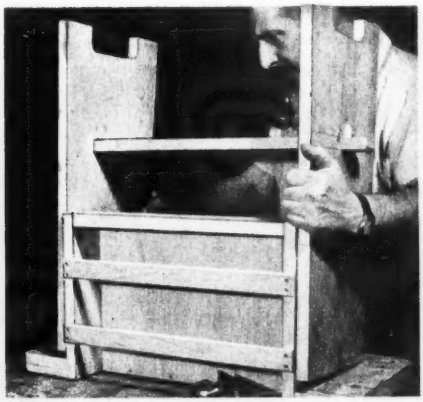
Fastening slats to the sides of magazine rack. Holes are drilled first to prevent splitting.



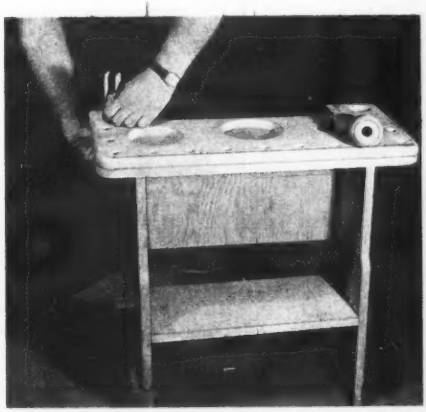
for them in the top. At this point don't make the opening for the magazine rack but wait and cut it exactly to shape after the rack has been finished.

This operation is the next step. Begin it by cutting the pieces for the rack to size and screw them together. Now cut the opening in the top to take the rack and fasten it in place. Any cracks around it can be filled with plastic wood or glue-sawdust paste.

The sides are then cut to size and shape and the mortises cut for the shelf. Follow the drawing for the details of these. The shelf is cut next and the tenon at each end squared up to fit snugly in the mortise on the corresponding side. Drill holes in the tenons at a slight angle to keep the pins from falling out. Do this so that only half of the hole is visible when the tenon is in place. The pieces are assembled by tapping the pins [*Continued on page* 148]



Assembling the sides and top. Pins are dowels flattened on one side and tapped in place.



On the home stretch—attaching the match-box holder. Pipe-cleaner tube is at the right.

car care

BY FREDERICK C. RUSSELL

REPLACING THE FAN BELT? If so, don't be content with discarding the old belt and installing a new one without checking the reasons for the demise of the old belt. In one case I found the belt rotted because of oil leaking from a loose timing gear cover. In another case the belt frayed, and broke because the pulleys were not in line. Greasy pulleys will also shorten the life of your fan belt.

ASYMMETRICAL IS A BIG WORD until you break it down by taking off the "A." A fan with such a nickname is merely one with blades that are not evenly spaced. Asymmetrical headlights are those which can be made to throw a special passing pattern with one beam directed to the right instead of straight ahead.

TOO LEAN OR TOO RICH? That need not be a carburetor question if you make a few simple observations. Sputtering and backfiring usually mean a too lean mixture. With an over-rich mixture the engine gallops; it will also buck and stall. It's true that a lean mixture will encourage stalling but when the mixture is too rich the engine is reluctant to restart.

WINDSHIELD WIPERS. A wiper that fails to run for more than one full

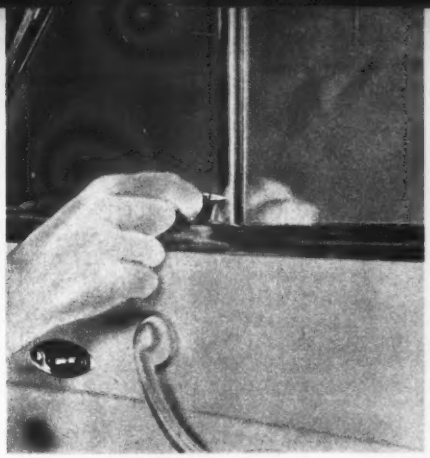
TRY IT!

Priming the oil pump may seem to be quite a complicated matter but there's an easy way to do the job if the car has a vacuum-operated windshield wiper. First disconnect the line to the oil pressure gauge and run a short length of ¼ in. rubber tubing from the line to the wiper line. Then remove the spark plugs and squirt some engine oil into the cylinders and replace the plugs. When you run the engine, a few minutes' intake suction will draw oil up from the pump, thus priming it.

POOR GAS MILEAGE may be merely due to a sluggish spring in the choke control which allows the choke to remain partly closed all the time. This makes a too rich mixture.

FEATHER EDGE WEAR on front tire treads is a sign of poor wheel alignment. Checking up to remedy this should include inspection of the kingpins and bushings as well as the tie rod.

YOUR CAR'S NOT LOCKED if the pins which secure the ventilating wings are bent. Passengers often bend them when they try to crank the windows without releasing these pins. Remove them and straighten in a vise.



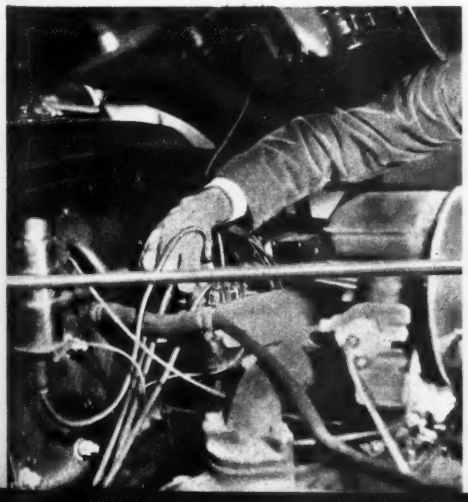
sweep across the glass often can be made to keep going by turning the control button on and off.

PISTON REMOVAL. Short cuts do not always pay. For instance on many engines the pistons and rings can be replaced without taking off the cylinder head. But, unless the head is removed, there is no way of removing the ridges which the pistons make at the top of their travel. After a bearing job there is bound to be a knock unless a ridge reamer is used to smooth out the cylinder walls. Be sure repair shop has equipment to do this before leaving your car for overhaul.

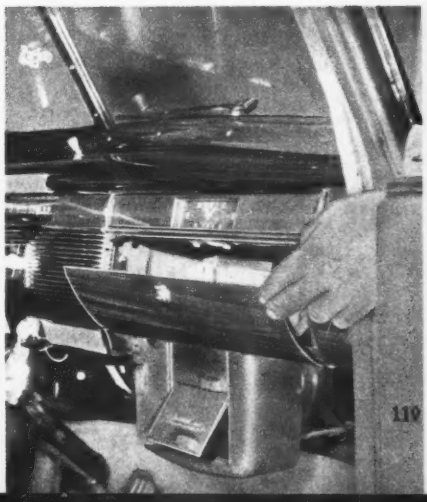
Below: A TIRE SPREADER should always be used to check the condition of old as well as new shoes. Cuts, which usually are on the inside of the tire, should be vulcanized immediately.

Your car needs careful attention to give long and faithful service. If you have a problem with your car, ask Mr. Russell. Just send stamped, self-addressed envelope to him at MECHANIX ILLUSTRATED, 347 Madison Ave., N. Y. 17, N. Y.

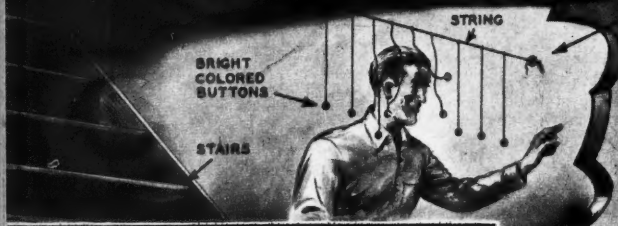
ENGINE SHIMMY is a normal characteristic of "floating power" but one penalty of this system is the way the distributor is shaken up. Always make certain that the wires are firmly inserted into the distributor cap.

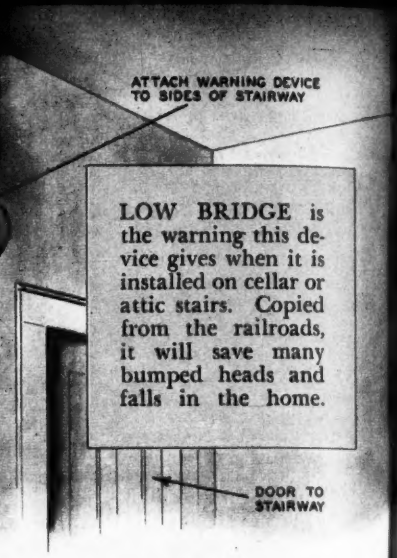


Below: A RUN DOWN BATTERY puzzled reader H. N. S. until he found out that a worn catch in the glove compartment allowed the door to drop down during parking periods causing the compartment light to turn on automatically.



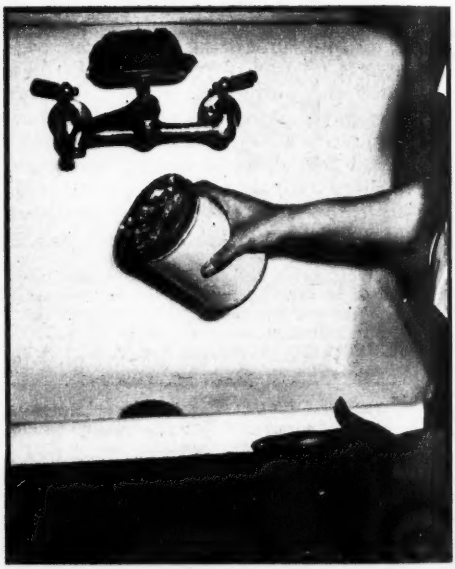
TIPS FOR THE HOME



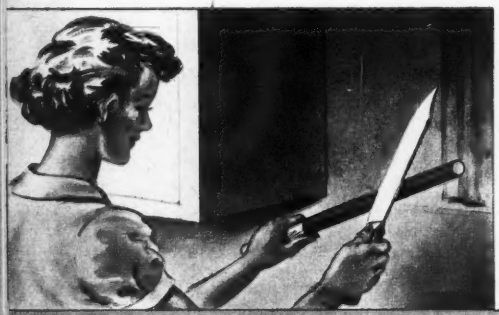


LOW BRIDGE is the warning this device gives when it is installed on cellar or attic stairs. Copied from the railroads, it will save many bumped heads and falls in the home.

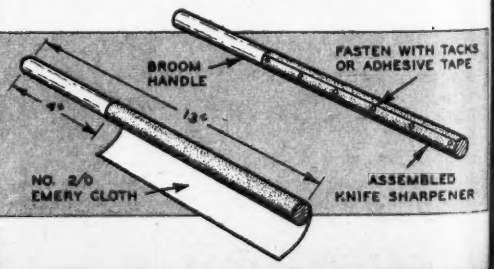
KEEPING MATCHES DRY on hunting or fishing trips is no problem if the heads are first dipped in clear nail polish. This also makes the matches burn brighter.



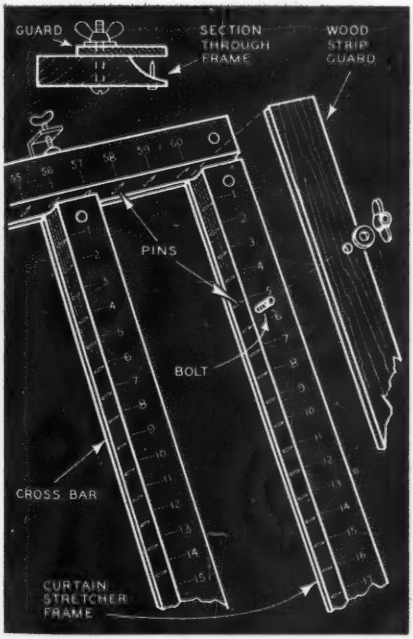
SAVE ON SOAP by making a dispenser from any large tin can with a slip-on cover. Large holes are punched in the cover and the can is filled with soap grated to the correct size from old bars and small pieces.



INEXPENSIVE KNIFE SHARPENER is easily made from an old broom handle and a piece of 2/o emery cloth. When the emery cloth becomes worn, the outer layer can be torn off, exposing a fresh surface.

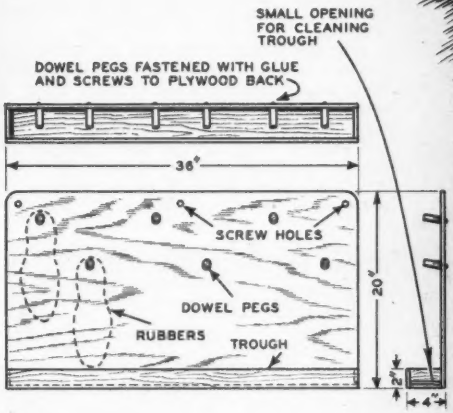


PREVENT CONDENSATION on basement water pipes by wrapping old newspapers around them to a thickness of ½ inch. By painting the outside of the paper, all condensation of moisture in warm weather is eliminated.



PINS ON CURTAIN STRETCHERS can be made harmless by using a wood strip guard over them. This prevents scratched fingers when the frames are handled. The guard is easily removed.

WET RUBBERS can be checked at the door with this convenient rack made of scrap materials. The trough at the base collects the mud and dirt that would normally be tracked in the house.



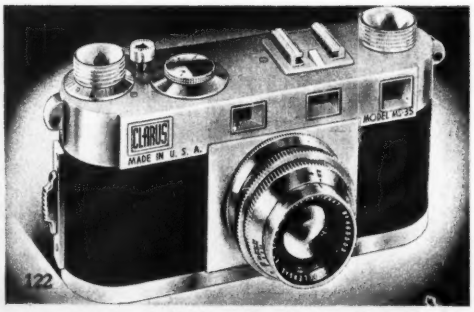
STORAGE SHELVES made by stacking empty orange crates cost practically nothing and will take considerable weight. The heavier canned goods should be placed in the lower crates.

NEW PRODUCTS
of scientific and mechanical interest

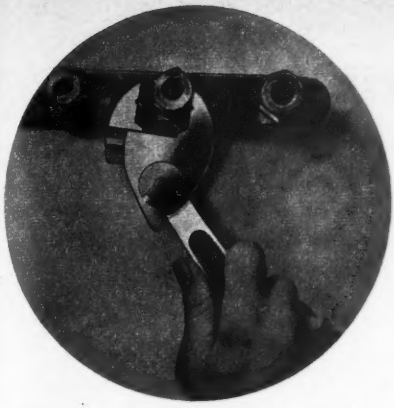
A MODERN VERSION OF THE STEREOSCOPE is this new tri-vision viewer recently announced by the Haneel Company of Los Angeles, Calif. It is designed to be used with a new twin-lensed stereoscopic camera made by the same company. Black-and-white or color pictures taken with this fit in the viewer where, lighted by enclosed batteries, they are reproduced in three dimensions. Both camera and viewer are molded of Tenite plastic.

CARRIED LIKE LUGGAGE and assembled in 10 minutes without using tools, this new sectional rowing or outboard skiff is being made by Link Aviation Devices of Binghampton, N. Y. Built of moulded plastic with ribs and frame of laminated hardwood, the boat is made water-tight by means of a canvas boot. Assembled, it is 14½ ft. long, weighs only 70 lbs., and can accommodate four people.

VENTAIR is the name of a new, draft-free window that won't stick or bind, and which eliminates complicated parts and troublesome weights. Each sash can be tilted for ventilation or removed completely for cleaning from inside. Hayman Window Co. of Denver makes it.



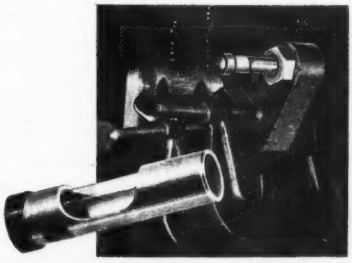
A NEW MINIATURE CAMERA is being produced by the Clarus Camera Manufacturing Company of Minneapolis, Minn. Designed for 35 mm. film, the camera has an f-2.8 lens and a curtain type focal plane shutter using intermittent action. It is priced around $100.00, plus tax.



SKINNED KNUCKLES AND LOST TEMPERS are eliminated with this automatic, adjustable, racket-action wrench produced by the Hedstrom Industries of Chicago. Made in 6 and 8 inch sizes, the new tool has an automatic "eye," adjustment control that provides a constant, non-skid grip on the nut.

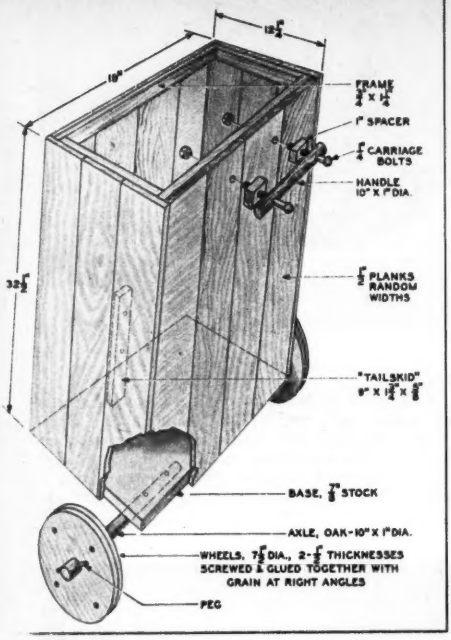
A TRAVELLING HOME FOR TWO is this new sportsman's trailer fabricated by Kit Manufacturing Company of Norwalk, Calif. Using aircraft construction with a welded steel frame and an aluminum body, the trailer provides sleeping space for two and a streamline galley. The selling price is $448.00, f.o.b.

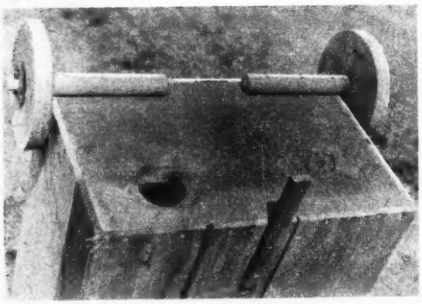
WALL FINISHING with water paints, is faster with the Strainco Paint Tray, introduced by the Strainer Products Corp. of Montclair, N. J. A patented metal screen incorporated in the tray removes excess paint and gives the roller an even coat. The price is 59c at hardware stores.



CHECKING CUTTING TOOLS is easy with a simplified optical tool designed by the Benton Company of Los Angeles. Fitting in any machinist's tool kit, it measures the rake and cutting angles of all tools up to 1 in. diameter and will also check larger tools by using a surface plate.

A GOLF BALL MARKER that stamps your name indelibly into the ball, is being manufactured by the Holliday Products Company of Dayton, Ohio. It consists of a handle with the name set in metal type and a base with an ink pad and grooved slot to hold the ball. Priced at $2.00 the marker should pay for itself in reclaiming lost balls.





Axle and wheel assembly. Note knothole drainage system and tailskid.

handy walkie • • •

Some scrap lumber, nails and a couple of hours' work yield this go-cart for shopping use and garden work.

THE Handy-Walkie is intended to take the place of the burro—that is, the place the burro fills in less so-called civilized places. In short, it's a jack-of-all-trades, a carry-all, the handyman's helper; it will spare your wife the burden of having to lug the groceries, garden tools, laundry, etc., in her arms. The only thing you will have to supply is the energy to make it and the manpower, or should it be womanpower, to motivate it. If you don't feel up to these requirements, just relax, turn the page and forget it. Otherwise, go to your lumber yard and get 6 ft. of 3/4x1 3/4 in. fir, three or four packing cases that contained window glass—these are generally made of 1/2 in. oak or chestnut and the lumber dealer will probably be glad to get rid of them for about 20c apiece, a slab of fir 7/8x11 1/4x18 in. for the base of the Handy-Walkie, a six-foot length of 1/2x8 in. fir for the wheels, a 1 in. dowel, 30 in. long, for axles and handle, and two 1/4x4 in. carriage bolts. You will also need a few nails, six screws and a piece of scrap wood for the handle spacers and the "tailskid."

To start the job, nail a few slats from the glass [*Continued on page* 150]

Far left: Marketing is a cinch with the Handy-Walkie, plenty of room for the laundry and that extra quarter-pound of butter.

You will find Handy-Walkie indispensable in the garden for toting fertilizer, old leaves, vegetables, tools and rubbish.

PREPARE NOW TO GO ALONG!

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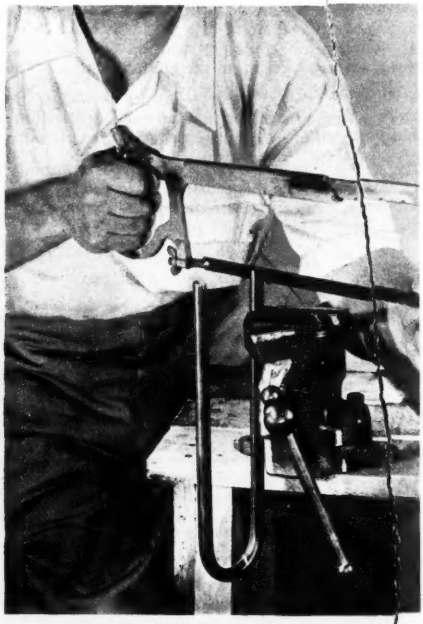
BY EVAN P. JOHNSON

There's no need to discard your youngster's tricycle just because he has outgrown it; convert it into a real two-wheeler bike.

BIKE from a Trike

Use a hacksaw to cut the frame of the old tricycle at point shown in the photo.

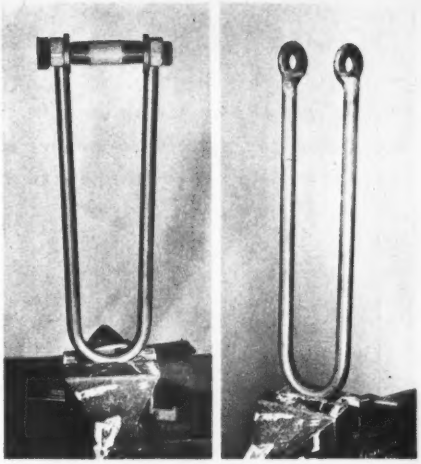


The ends of the tubing are cut so as to provide a flat side for the two washers.

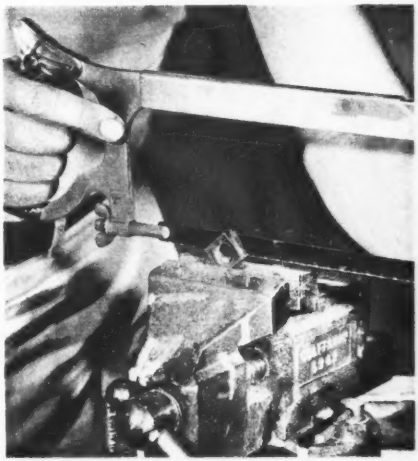
BICYCLES are just another of the many modern conveniences we take for granted. And yet, it was only during the last century that they made their appearance as man's fastest means of self-propelled locomotion. In 1866 the first bicycle equipped with a crank and pedal made its appearance in the United States. It was dubbed the "bone-shaker" or "dandy-horse" and sold for about $300.

Today the bicycle is almost a must in every home where there are children and one of the greatest thrills of early childhood is learning to ride on a two-wheeler bike. For the youngsters who quickly outgrow their toys, here is a means of converting their old tricycles into veritable gifts from fairyland.

From an ordinary tubular from tricycle remove the rear part of the body by cutting it off from the frame as shown on page 126. Remove the rear wheels and select the best one for the rear bicycle wheel. A new fork must be made to accommodate this wheel. This is made of ½ in. or ⅝ in. steel tubing, or solid iron stock. The length will depend upon the size of the wheel to be used. It should be bent, with a two inch radius, into a fork shape which will accommodate the wheel and permit ample clearance. If your home workshop does not have the facilities for doing this, try the local garage or blacksmith. Next, cut the ends of the tubing so as to provide a flat side on which to [*Continued on page* 150]



Left: The washers assembled for welding. Photo at right shows finished welding job.

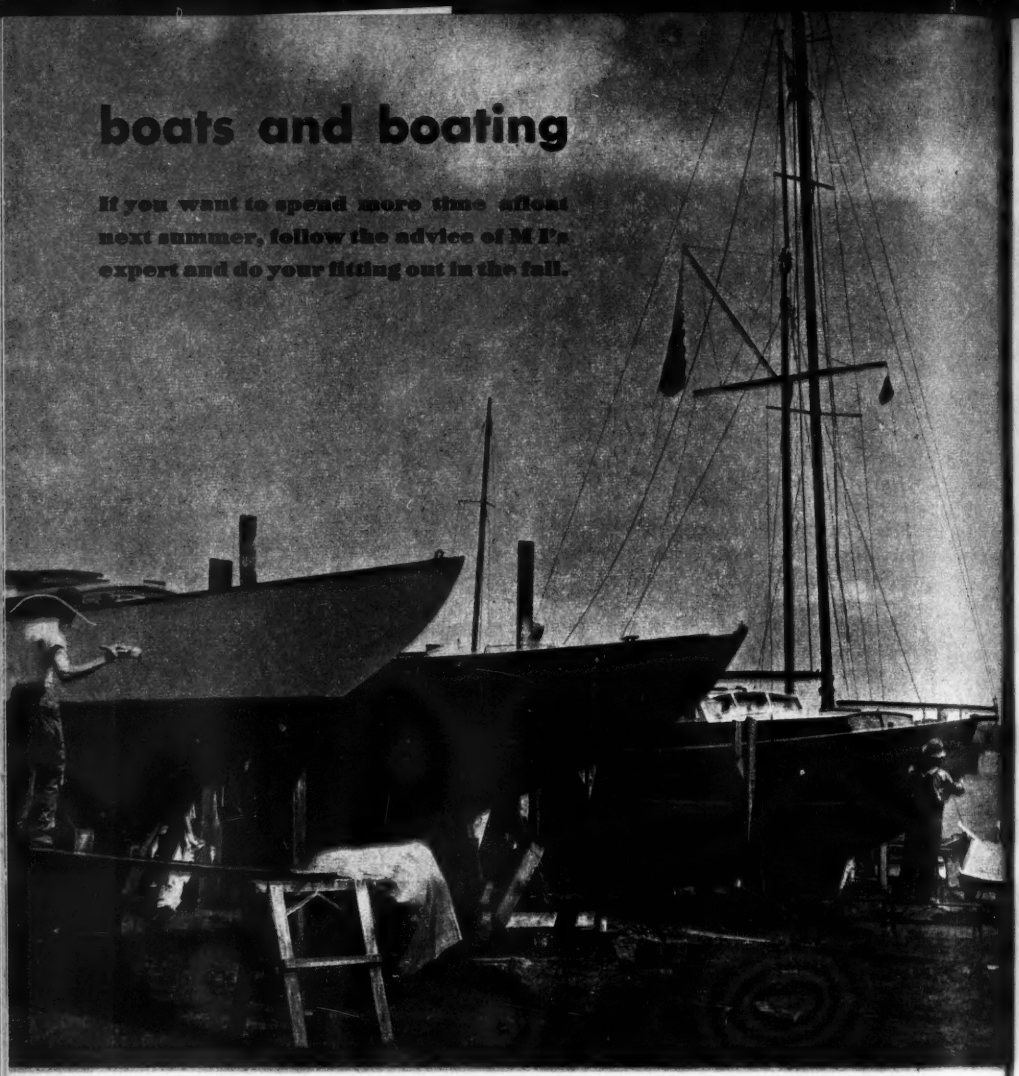


Top: Splitting a nut in halves to make a lock-nut. Below: How the fork can be bent to overcome any difficulty in steering.

Two wrenches are used to true up the wheel and to make the final tension adjustment.

boats and boating

If you want to spend more time afloat next summer, follow the advice of M I's expert and do your fitting out in the fall.



Rosenfeld photo

BY WILLIAM F. CROSBY

MUCH has been said about the annual chore of fitting out sail and power boats but most of this advice is given with the thought of doing the work in the spring just before the boat is put over. By moving the calendar ahead a few months and doing most of your fitting out in the fall, you can reduce the spring work to a minimum and spend more of your days on the boat instead of beneath it. Not only will you get more enjoyment during the next season but your boat will also be in better condition for winter storage.

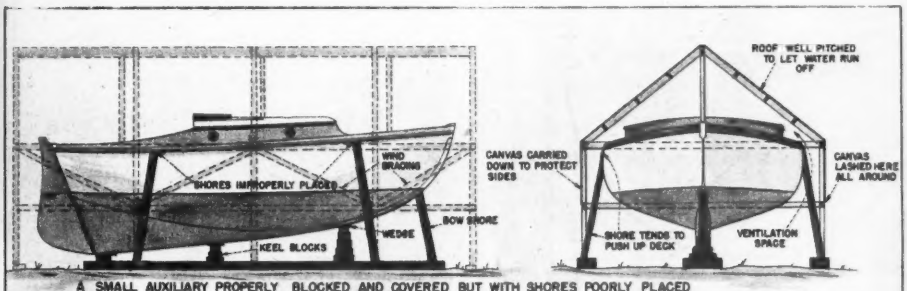
The time to begin your overhauling is just as soon as the boat is pulled out of the water. With a stiff broom and a strong stream of water, clean off the marine growth from the bottom while it is still soft and mushy. Don't make the mistake of waiting until the next day because by then it will be as hard as cement and nothing short of blasting will get it off.

The most important factor in storing

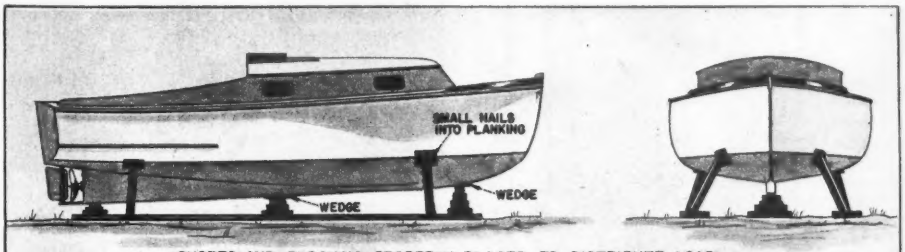
a boat for the winter is the blocking and shoring used to support the hull. Unless this is done properly, your boat may be sprung out of shape by spring, necessitating costly repairs. Most yards attend to this work but if you're doing it yourself, here are the important things to watch. Since boat hulls rarely sag in the center but settle instead at the bow and stern, the keel blocking should be placed to support the ends properly. See to it that the blocking at the center of the hull isn't higher than the ends or you'll have trouble. Place the end blocking as far forward and aft as possible and it's a good idea to check all blocking several times during the winter to make sure it hasn't shifted. If it is placed directly on the ground, alternate freezing and thawing may move the blocks out of line. You can avoid this by using heavy fore-and-aft timbers as the base for your supports.

While the blocking will support the hull along the keel, it is also necessary to use shores along the bilges to keep the hull upright. These should be heavy and rest on ground timbers to prevent settling. At the upper ends of the shores, use good sized cleats to spread the load over a large area of planking. Wedges may be used to equalize the stress on the shores but don't set these up so tight that the weight is taken from the keel blocking and transferred to the shoring. The only function of this is to keep the hull upright. Above all else, don't run shores up to the under side of the sheer molding or rub strake. If you do this you're running the risk of having them push up the sheer molding and the deck along with it. This will start a deck leak that's difficult to cure.

With the boat properly blocked and shored, begin at the highest point on the hull and wash it right down to the keel, using warm water and soap. Give any bright work or light colors particular attention and don't make the mistake of sandpapering white paint before you've washed it. If you do, you'll simply rub the dirt into the finish and it will work through the new paint. If you have kept up the bright work during the summer, all it will need is a light coat of varnish. However, if you let it go untouched all winter, it will darken and discolor which means spending hours with a scraper in the spring. This is a good example of the time you [*Continued on page* 144]

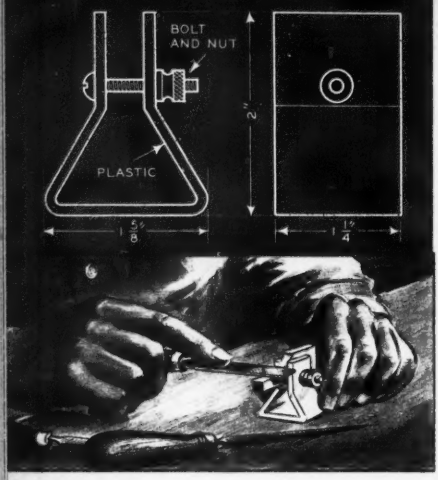


A SMALL AUXILIARY PROPERLY BLOCKED AND COVERED BUT WITH SHORES POORLY PLACED

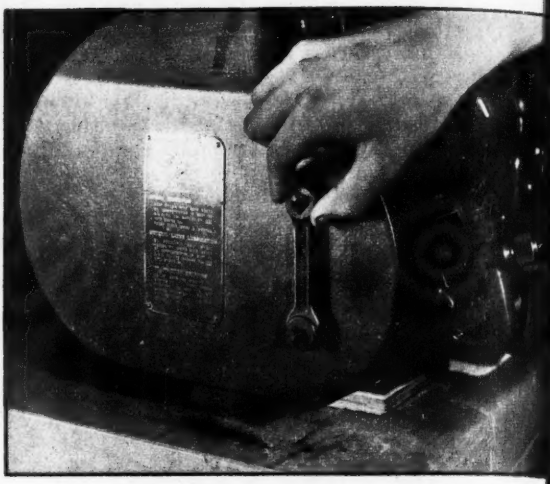


SHORES AND BLOCKING PROPERLY PLACED TO DISTRIBUTE LOAD

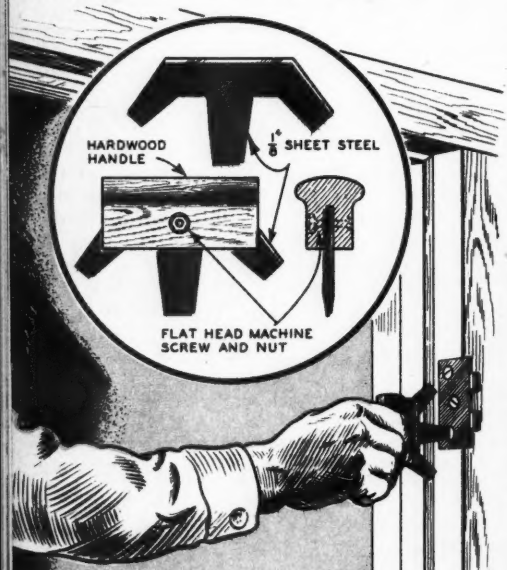
SHOP KINKS



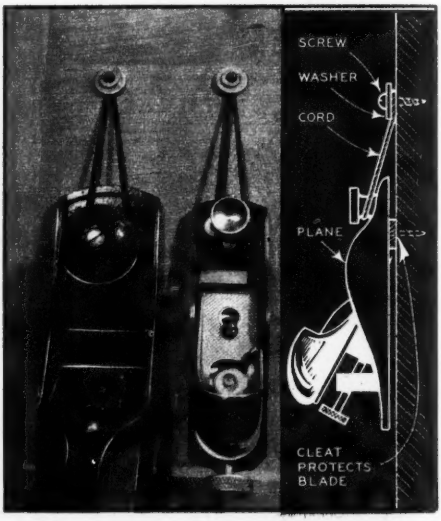
FOR HOLDING SMALL PARTS in an upright position, a small vise made of plexiglas or lucite is ideal. The plastic strip should be heated in an oven until pliable and then bent to shape with gloved hands. Larger or smaller size clamps can be made by changing the dimensions.



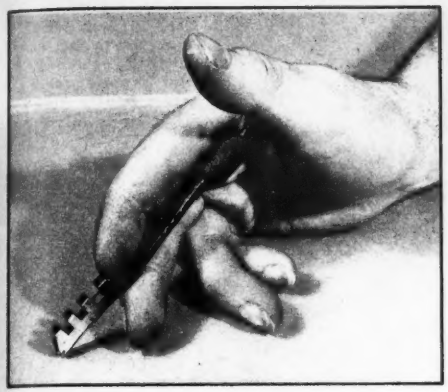
A CONVENIENT MOUNTING for the lathe wrench is easily made by drilling the gear box cover and installing two machine screws as shown. The top one is bent up to keep the wrench from shaking off. This arrangement places the tool close to the operator and saves the time one ordinarily would spend hunting for the wrench under the lathe bed.



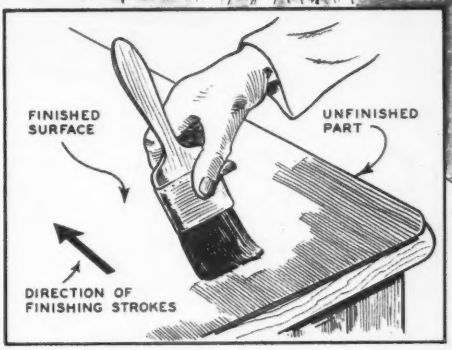
LARGE HEAD SCREWS in butt hinges, can easily be removed with this screwdriver. With a choice of three blade widths and thicknesses, there's much less chance of enlarging the slot of the screw.



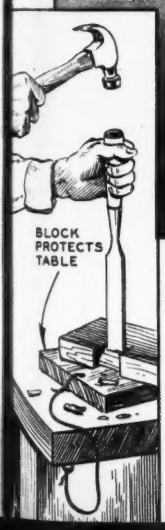
SUSPENDERS FOR PLANES prevent damage to the cutting edges and make it easier to remove the tools from cabinets or walls. The cord from Venetian blinds can be used or any other stiff cord that will retain an open loop when the planes are removed.



A BETTER GRIP on glass cutters can be obtained by wrapping a length of adhesive or friction tape slightly above the middle of the handle. By grasping the cutter with the tape in the crotch between thumb and index finger, the tiring pressure often experienced is removed from fingers.

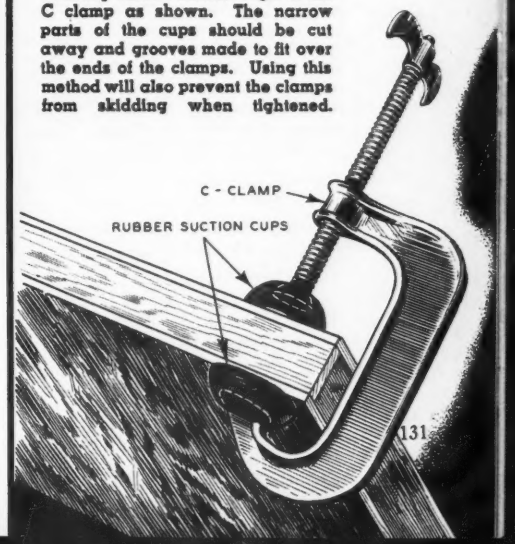


IN PAINTING, did you know that you can avoid brush marks in the final coat by applying the paint from the unfinished part toward the finished surface? Of course you can brush the paint on from both directions when you begin, but in the final smoothing follow this suggestion for a good finish.



BENCH BLOCKS protect the tops of work benches but are easily misplaced. This can be eliminated by attaching the block to a piece of string and tying it to the bench.

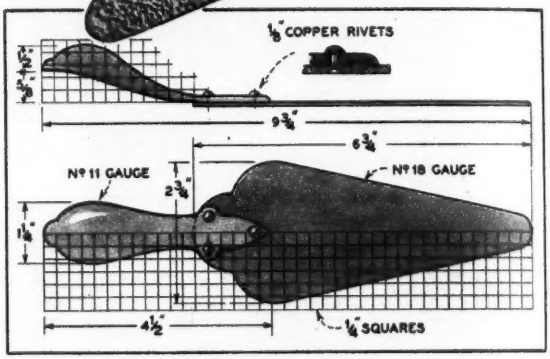
TO AVOID CLAMP MARKS on highly finished surfaces, attach ordinary rubber suction cups to the C clamp as shown. The narrow parts of the cups should be cut away and grooves made to fit over the ends of the clamps. Using this method will also prevent the clamps from skidding when tightened.



Use the knife with a sawing motion to cut soft cake. It also doubles as a server for the host.

CAKE SERVER

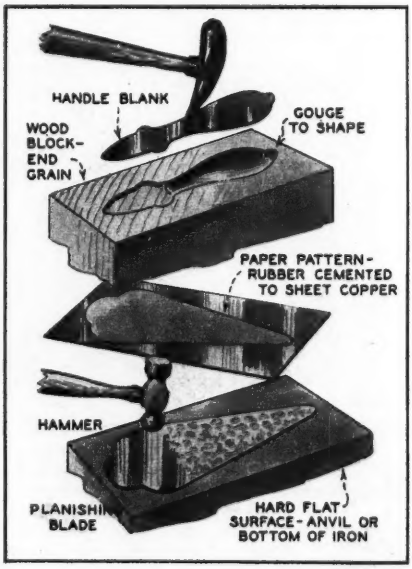
A copper cake knife adds an air of elegance to the table.



DO YOU eat your cake with your fingers or do you use a fork? Whatever your technique, the accepted method to serve cake to the ultimate consumer is by means of a cake ladle or server. This one is made by first cutting a piece of No. 18 gauge copper to the shape indicated. Lay out the pattern on paper, paste it to the copper and cut to shape. Then, using a ball peen hammer, texture the surface of the copper, and pumice out all scratch marks.

A handle blank is cut to pattern out of No. 11 gauge soft rolled copper. Gouge the hollow form of the handle out of a 2x6 in. timber. Set the metal blank over this matrix and hammer it into shape. Round the edges of the point that overlap the blade with a file, smooth it down with emery cloth and pumice.

Now lay off three points of the handle for the rivets and drill 1/8 in. holes. Place the handle on the blade and drill the holes for the rivets. Set three round-head copper rivets in place, hammer them flush and solder.—*Simon Palestrant.*



BONNIE, 18' V-bottom auxiliary sloop. Plywood construction, seaworthy. No. 944, $3.00, (with full-sized patterns, $7.00).

SNUFFY, 12' plywood car-top utility outboard. Lightweight, strong and durable. No. 955, $1.50.

TESTED BOATS

Scale Blueprints

SCRAM III, 16' inboard designed to take a model B Ford marine conversion engine. Simple plywood construction throughout. No. 936, $1.50.

FLYER, 12' outboard utility. Uses 1 to 10 h.p. engine, does up to 20 mph. No. B-142, $2.00.

BUILD WITH M.I. PLANS

TESTED MODELS

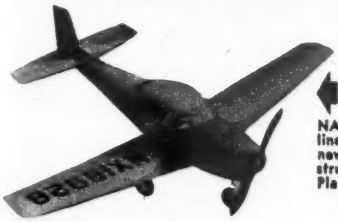
Full-Sized Plans

BOUNCIE, 32-in. speedboat. Easy to build, takes any engine. Plans also contain instructions. No. 362, 50c.

P-51H MUSTANG, 32-in. control-line job features removable landing gear, take-off dolly. Realistic, easy to build and fly. Plans, instructions, No. 364, 50c.

TIGERCAT, 36-in. control-line fighter. Flies on either engine. Good club project. Plans, instructions. 366, 50c.

SPEEDWAGON, former class C AMA record holder. All-around flier, good beginners project. No. 366, 50c.



NAVION, 36-in. scale control-line model of North American's new lightplane. Simple construction, tricycle landing gear. Plans, instructions, No. 369, 50c.

SNOOTIE PLANS

FULL-SIZED drawings of the contest gas model described on pages 100-104. No. 370, 50c.

The plans listed above are made available through the MI Reader Plan Service. Accurate and easy-to-follow, they save you considerable building time. These are only a few of our plans. Send a 3c stamp for the new 60-project illustrated MI BLUEPRINT BOOKLET. Mail your request today to: MECHANIX ILLUSTRATED READER PLAN SERVICE, Greenwich, Connecticut.

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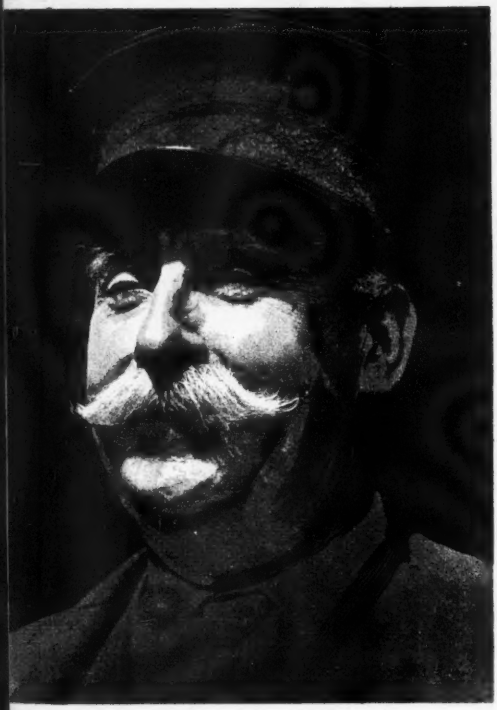
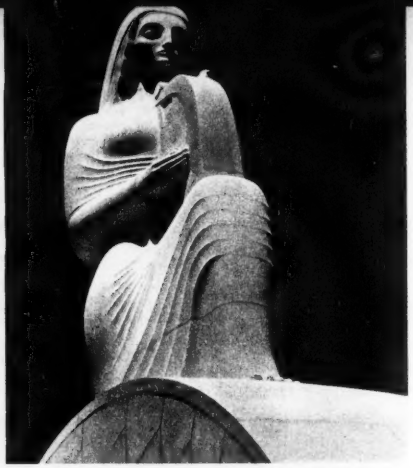
10-46

Color Photo Fans, see page 152 for MI's Color Photo Contest rules.





"Repose," a $5 Award captured by Gladys Diesing, Long Beach, Cal. This interesting study was taken with a No. 33 Recomar.

Top: 1st Prize—"British Tar," $10 to Ernest Palinkas of New York City. Graflexed on Super XX.

Right: "Gray Boy," by S. P. Murphy of Elizabeth, N.J. A $5 Award winner. Speed Graphic camera.

Below: "Colleagues," $5 Award to Keith W. Jones of Villa Park, Ill. An open flash shot at f-22. Ansco Super Pan.

portraits in GOLD

Exquisite miniatures made with interchangeable backgrounds.

BY S. J. RESSETAR

YOU can add a very fascinating and profitable angle to your photographic hobby by making gold-toned pictures. The idea is astonishingly simple, and the results are amazingly beautiful. No method of reproduction can do justice to a gold-toned picture; it must be seen to be appreciated. The picture glows with an inner light that has all the warmth and beauty of sunshine. Besides it has the very important quality of depth.

Gold-toned pictures have a very luxurious appearance, but they cost no more than an ordinary photograph. And making one is just as easy. It is just a matter of making a positive transparency and adding a sheet of gold-colored paper to the back.

Making a positive transparency is no more difficult than ordinary printing and enlarging. For your material you have a choice of process film or lantern slide plates. By using plates one does away with the glass for framing purposes. On the other hand, film will be preferred for a picture for milady's locket or a man's wallet. The films and plates are about as fast as enlarging paper and can be handled under the same safelight.

For those who haven't had any experience with process film or plates, it is suggested that the beginner first try lantern slides. [*Continued on page* 152]

For pocket use the film transparency should be backed with stiff cardboard and the edges bound with tape.

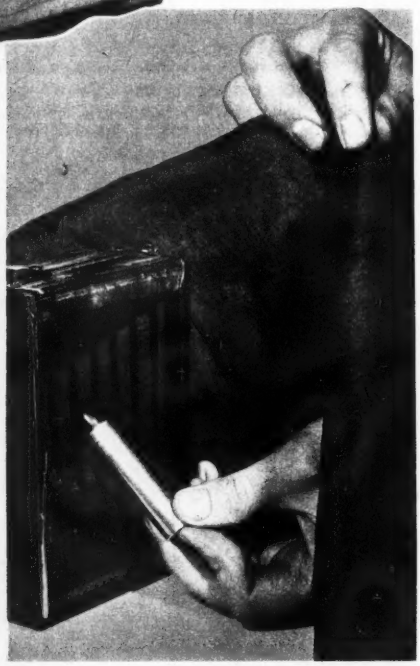
Right: The three pieces before binding. Use gold paper for portraits, green or silver paper for landscapes.

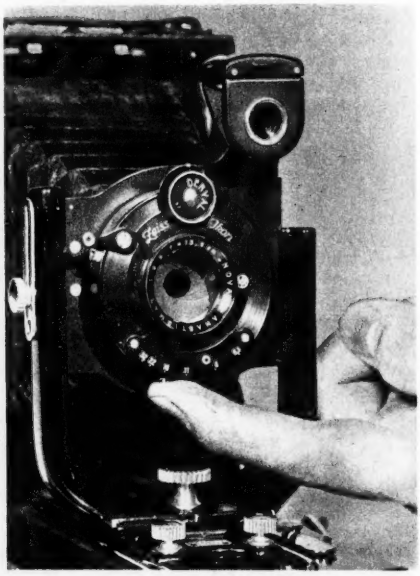
Buying a Used Camera?

BECAUSE new cameras are still scarce, many of us will turn to the thought of buying a used camera. Which is a perfectly commendable idea, but, as the cagey Romans said, "Let the buyer beware." In other words before you shell out, look out. A second-hand camera should be purchased at a considerable saving over a new camera. Generally speaking most dealers sell used equipment at 75% of list.

Pull out the lens. Is the action smooth? Does it lock at the stop? Lens board should be upright, at right angles to bed.

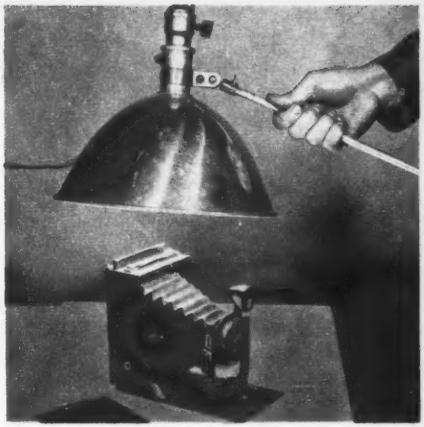
Below: Set the shutter on "time" and move the iris diaphragm. Make sure there are no missing or bent leaves.



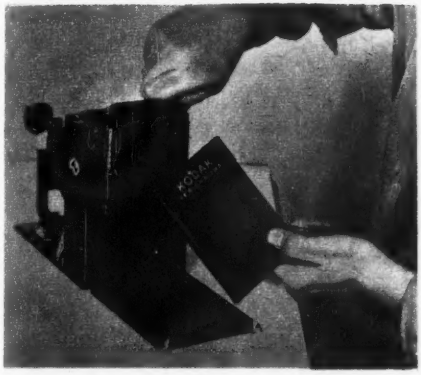


Left: Take the camera into a dark room and run a flashlight along the inside of the bellows. Light leaks will show up as pin points of light.

Check distance scale by focusing with the ground glass on a newspaper page. The scale on the camera should read the same as the yardstick.



An exacting light leak test: Load camera with film, move it around under a photoflood and develop film. Leaks show as dark streaks on negative.



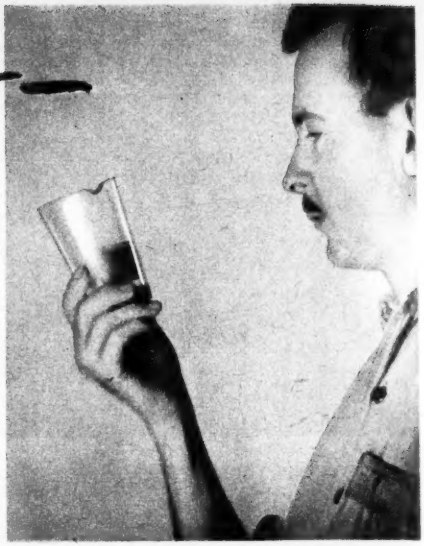
Examine filmpack adapter and cut film holders for signs of wear and ease of installation. Spools in a roll film camera should fit smoothly.

Below: Shutter should operate at all speeds with cable release or lever. You should be able to distinguish some difference in the various speeds.

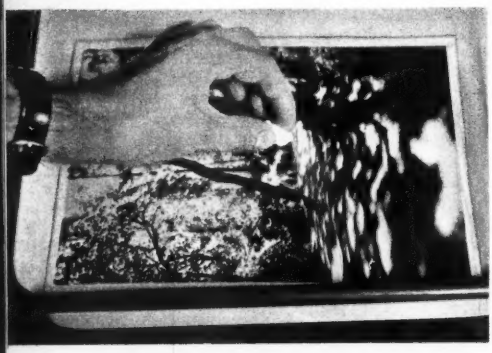
Check the tripod sockets on the camera to see that the tripod fits squarely. Sockets on European cameras will require special adapters.

Do you Know—

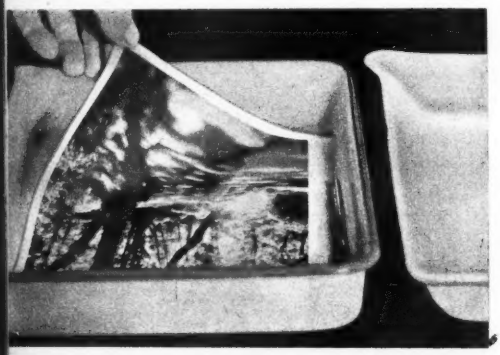
THAT the mysterious Farmer's Reducer mentioned by professional photographers is nothing but a solution of Potassium Ferricyanide (15 grains to an ounce of water) added to an ounce of plain hypo dissolved in 32 ounces of water. The ferricyanide solution should be added to the hypo solution just before use as the two solutions decompose rapidly when together.



That you can watch the action of Farmer's Reducer in cutting down density of a negative by placing film in a graduate and holding it up to light. Have water handy to stop reduction.



That a piece of cotton dipped in a solution of Potassium Ferricyanide and applied to a hypo-laden print can be used to highlight small areas. Immerse the picture in a tray of water to halt the reducing process.



That prints can be cleared of fogginess due to stale paper or an unsafe light by soaking them in a plain hypo bath and then transferring to a Potassium Ferricyanide solution.

THE QUESTION BOX

By Robert Brightman

Photo fans! Use this column for answers to any of your problems on photography. If the question involves a print fault please include the print with your letter (and postage for its return).

Is there any practical way to flatten out curly negatives without damaging them? Robert Harris, Yuba City, Cal.

Roll them up in the pages of a magazine so that the curl is reversed and let them stay that way for about two hours. If the negatives are in a roll, such as 35mm, roll them up in a cylinder and place a rubber band around them.

Can you tell me how I can make ground glass for focusing? Mrs. Huron Gist, Colorado City, Tex.

The easiest way to make ground glass is by flowing ground glass substitute over a piece of ordinary glass. The best way, however, is to actually grind it. You can do this by smearing a little valve grinding compound (available at any auto supply store) over a sheet of glass. Then apply the bottom of a salt shaker to the compound and rub it around with a circular motion. If you cannot get valve grinding compound buy a couple of ounces of No. 400 carborundum. Mix this with water to form a thin paste and grind it the same way with the salt shaker.

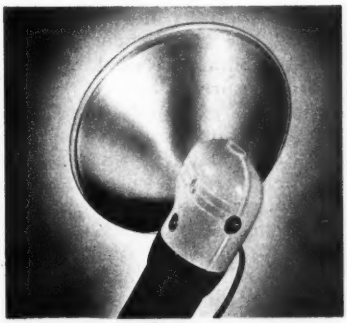
Can I use color film in my Six-20 Brownie Special? Simon P. Klepper, Rogersville, Tenn.

Generally speaking color film such as Kodacolor or Ansco Color should be used in a camera with an anastigmat lens. You can take pictures in your Brownie Special but they will appear slightly diffused. If you do undertake it be sure that you take your shots in bright sunlight with the largest opening.

With flash-equipped Kodak, you're set to shoot anywhere, any time

Illustrated: New Kodak Reflex. Big image in the ground glass makes composition easy . . . helps you get in focus fast. Finder lens and taking lens are Kodak Anastigmat *f*/3.5's . . . taking lens *Lumenized* to reduce flare and ghost images. Shutter is 1/200-second Flash Kodamatic.

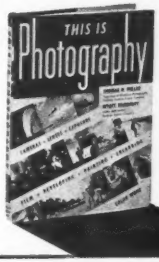
Twelve 2¼ x 2¼ shots on a roll of 620 Kodak Film . . . And nine full-color pictures, 2⅞ x 2⅞, with Kodacolor Film. At your Kodak dealer's . . . Eastman Kodak Company, Rochester 4, N. Y.



Ejector button on Kodak Flasholder saves burned fingers

New Kodak Flash Shutters—designed to operate in accurate synchronization with peak flash of lamp used . . . either "fast" Class F or "slow" Class M. **Kodak Flasholder**—Light, strong, equipped with brilliant, anodized aluminum reflector. Socket accepts either Class F or Class M midget bulbs.

Better pictures begin with this new, concise, comprehensive book on the "how's and why's" of photography. Sound and thorough treatment of night photography, exposure, color, filters, developing and printing, etc. Price, $2.00.



The latest on Kodachrome Prints

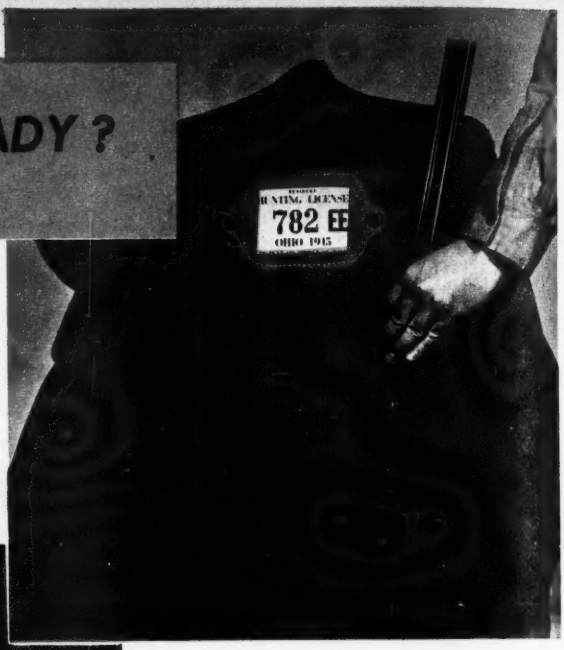
made from your Kodachrome transparencies . . . New size 3X, 3 x 4⅛ inches, 85¢. New low price on 2X size, 60¢. Minimum charge per order, $1.

Kodak

ARE YOU STEADY ?

BY H. LEEPER

Take a look and see what a so-called "instantaneous" exposure looks like.



The only shot taken with the camera on a tripod, note sharpness.

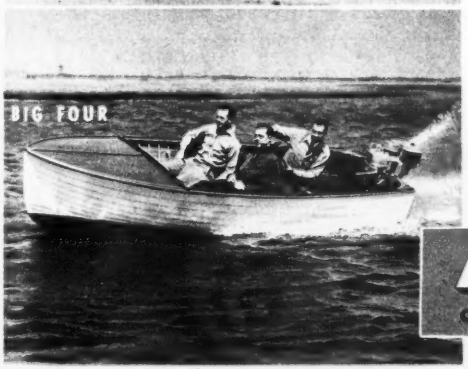
WHILE many photographers are able to hold a camera steady for longer periods than others, the tests illustrated show very plainly that while I may be steady in many respects, still and all I am not too "steady" when it comes to holding a camera. The arrangement, as shown in the top photo, was used for the different exposures.

Since all exposures were made from approximately the same position, a comparison of the top photo with the others will give you an idea of the magnification in the enlarger of the license plate. The shutter speeds are indicated on the photographs by the time marked on the cards above the license plate.

The enlargements at the left tell their own story plainly enough—your scribe should not attempt to hand-hold his camera at speeds slower than 1/50 of a second and expect satisfactory enlargements.

While I had read many statements along this same line, about the desirability of using a "fast" shutter speed, or at least using a tripod for speeds slower than 1/50th of a second, this is really graphic proof of the adage, "seeing is believing."

There's a "Four" for YOU—



—just right in size, power, performance . . . in Evinrude's complete line of 4 thrilling four-cylinder models!

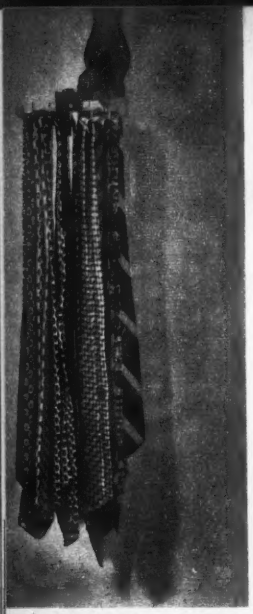
If you want a motor developing 5 horsepower or more — why not enjoy the *extra* smoothness — the *extra* thrill of performance — *that are yours with an Evinrude "four"?*

There's nothing like them — for any boat, or any kind of service! No other type of outboard motor to match their velvety surge of power, their responsiveness and flashing get away!

See your Evinrude dealer—look for his name under "Outboard Motors" in your classified telephone directory. Catalog of the complete Evinrude line of 8 models sent on request. Write for it today — address, EVINRUDE MOTORS, 5359 N. 27th St., Milwaukee 9, Wis.

EVINRUDE
OUTBOARD MOTORS

In Canada: Evinrude Motors, Peterboro, Ontario.



ROTARY TIE RACK

IF YOU'RE hanging your ties on some makeshift affair then this easily built rotary rack will have special appeal. Requiring only scrap wood, a bolt, 16 hooks and a few nails, the project should take only a few hours to complete.

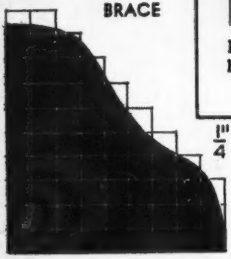
Before screwing unit to wall, drill ⅛ in. holes in back to prevent splitting.

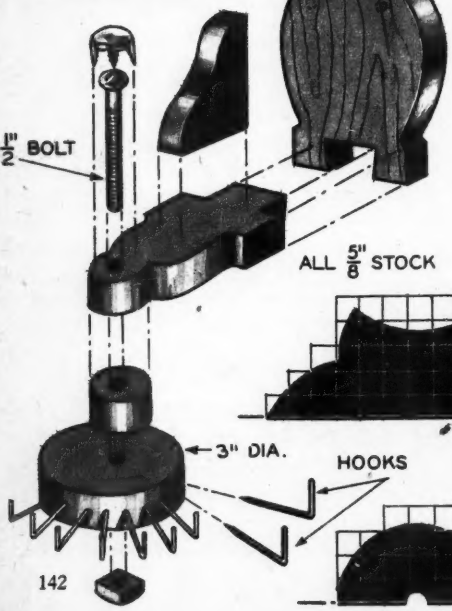
The original unit was built from ⅝ in. material but either ½ or ¾ in. stock can be used. First enlarge the sections of the drawings containing the ¼ in. squares and then transfer the outlines of the parts on the material. After these pieces are cut out and sanded, cut out the 3 in. diameter rotating disc and the 1½ in. diameter spacer.

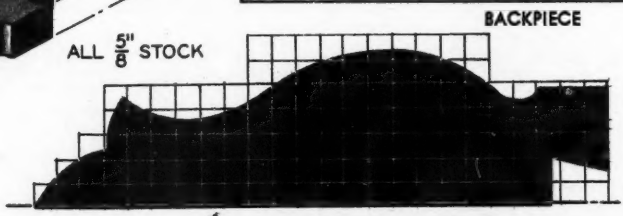
Drill the hole for the bolt in the arm, spacer and rotating disc and then glue the arm to the backpiece. Before attaching the disc, shellac all parts and screw the 16 hooks in place, as shown. Mount the unit to the wall with thin counter-sunk wood screws.

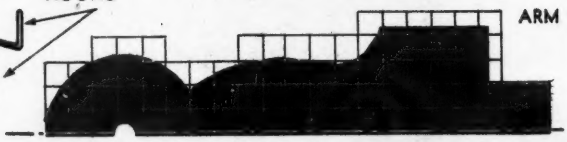
—*Bertram Brownold.*

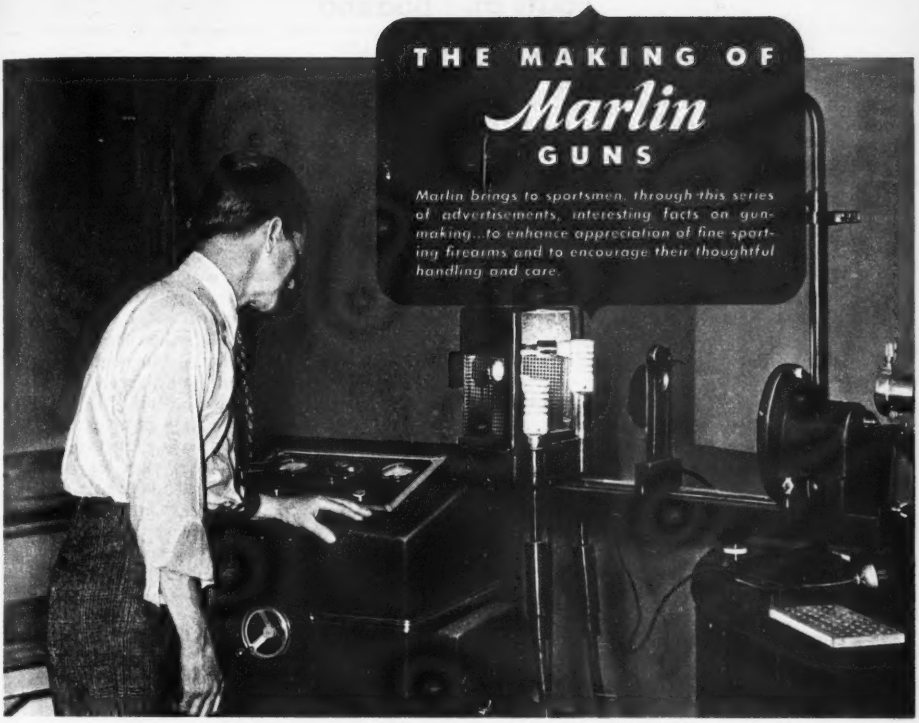
Simplicity of the tie rack is illustrated by its few parts. Normal capacity is 16 ties.











Laboratory Spectroscope Reveals Chemical Composition of Special Analysis Steels.

Pedigreed Steel

SPORTING GUNS OF American factory manufacture are equal to any and far better than most in safety and durability. A prime factor in this superiority is the use of "pedigreed" steels. Strength of parts which must contain enormous pressures —ranging up to 50,000 pounds per square inch— is achieved by special analysis steels. Because of their chemical composition and pre-determined reaction to tempering, they assure unfailing performance.

Gun steels are complex metals. Carbon, nickel, manganese and other alloying elements are combined with iron. In scientific proportions these mixtures are heated to temperatures where co-mingling of atoms occurs. Successive "heats" and quenches "fix" the properties of the final steel.

Both composition and crystalline structure of steels can be accurately checked by the laboratory devices pictured. All Marlin high-power rifles and shotguns get a final test for strength by firing a 50% over-load, and are "proof-marked" (JM).

Polishing Steel Specimen for Photomicrograph of Crystalline Structure.

Reprints of advertisements on the Making of Marlin Guns will be sent FREE to sportsmen on request.

THE MARLIN FIREARMS COMPANY

NEW HAVEN, CONN., U. S. A. · FOUNDED 1870

Boats and Boating

[*Continued from page* 129]

can save by doing most of your work in the fall.

If your deck is covered with canvas, it should be washed, lightly sanded and given a thin coat of paint. Wherever possible, remove the deck hardware and store it at home. There you can polish or paint it during the winter and have it ready for the spring. The topsides should be washed, lightly sanded and given a coat of paint. For the bottom below the waterline, a coat of red lead will provide the most protection during the winter weather.

With all the time and labor that you have spent on your boat, you should keep it carefully covered during the winter to prevent the snow and freezing weather from undoing all your work. The best type of cover is the one illustrated in the drawing. The framework for this is made of two by fours with a heavy ridge pole and fore-and-aft stringers to prevent pockets from forming and collecting water. The canvas should be stretched tightly over the framework to keep it from sagging and if possible have it fireproofed as an added precaution.

Moving inside the hull itself, all water should be drained from the plumbing and the engine. It is also a good idea to run the engine for a few minutes after you've drained the water out so that any remaining moisture will be evaporated.

The pipe connections to the fresh water tanks should be uncoupled and the tanks throughly drained. Open up the seacocks in the hull and make sure there's no water collected around them. After cleaning and treating them with graphite, make sure they operate and that they're closed before you finish your work at the yard. If you can't remove all the water from the toilet trap, fill it with kerosene and let it remain until the spring. The same thing goes for the traps in basins and sinks. There should be a wooden plug at the lowest point of the hull to drain every last bit of the water from the bilges. If you don't get this out, the water will work down in the seams and when it freezes, loosen up the planking. Dry bilges are a must for winter storage.

Don't forget the fuel tanks, particularly if they're made of galvanized iron. Present day fuels will corrode the zinc and the resulting sediment may make you sweat over the engine repairing it next summer. The engine itself should be laid up by removing the sparkplugs and squirting a tablespoonful of No. 30 S. A. E. motor oil in each cylinder. Be careful of dirt falling inside when you replace the plugs. The brass and steel parts of the engine should be coated with grease or vaseline to prevent corrosion and rusting. And don't forget to drain the gas line, carburetor, fuel stainer and pump. Put the battery down on your list of "must" items too, and when it's removed rely on a good battery service station to check it during the winter and keep it fully charged. If you must leave it in the boat all winter, have it fully charged in the fall and check it every few weeks with a hydrometer.

Going aloft, remove the masts and booms from the boat completely and store them for the winter in some dry place such as the loft of a boat yard. You can get at them there and save yourself a lot of work in the spring by sandpapering and varnishing them. The standing rigging should be handled in the same way. In removing it, coil each piece and tag it for easy identification in the spring. Give the running rigging the same treatment and store them both in a dry place.

Before you store the sails, take them from their bags and make sure they're thoroughly dry. If they show any salt water stains, spread them out on the lawn and rinse out the salt with a garden hose. When they're thoroughly dry, roll them up carefully, replace them in the bags and store them with the rigging. The blocks may be removed entirely from the spars and taken home for an overhaul during the winter. Check them over generally, and clean and grease them to prolong their life. With these tasks completed, your boat will come through the winter storage in good condition and with a few touches next spring, she'll be ready to go into the water.

Cabinetmakers' Clamps

[*Continued from page* 97]

of stock measuring 1¾x1¼ in. Smooth up the surfaces, bevel the edges and drill a ⅜ in. hole through the wide side to receive the bolt. The exact location of this hole is determined after the side brackets have been made and are laid in place. The four brackets are made from ⅛x¾ in. flat steel, 4½ in. long. Round the ends and drill a ⅜ in. hole as indicated. Place one on each side of the main rail with the block in place and pass a ⅜ in. bolt through the lower holes. Hold the steel pieces vertical and to such a height that the bolt will just clear along the bottom surface of the rail and then outline the hole on the block. Drill the hole and pass the second bolt through. It should be possible to move the block along the rail, with the steel strips in a vertical position, but when the block is pushed back, the lower bolt should catch on the notches in the lower side of the rail and secure it in place.

To prevent the movable block from coming off the rail, insert a ¾ in. No. 10 round head wood screw and washer at a point near the end of the rail. It is also well to insert a 1 in. No. 8 wood screw in the top of the fixed block to prevent the block from splitting when under tension.

When using the clamps, always place a small piece of wood between the movable block and the work and also between the pointed end of the hand screw and the work, to prevent marking the surfaces.—*Harold P. Strand*

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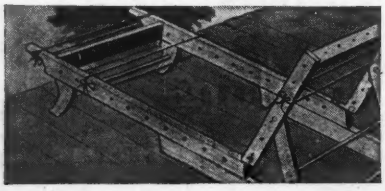
WORKSHOP WISDOM

Gluing rickety porch chairs



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CASCOPHEN

Snootie

[*Continued from page* 104]

ner cemented to the disc. However, props will be broken so attach the spinner in your pet manner.

WING CONSTRUCTION: The wing employs no new wrinkles or innovations in construction. Cut out the ribs and assemble on the spars. Build up the center section and, when dry, tilt the assembly over to one side. Once the panel is finished, remove pins to complete other half.

TAIL: The stabilizer and fin are even easier to build than the wing, although the procedure is much the same. Pin the spar and both edges directly over the plan, elevating the edges so their centerline coincides with that of the spar. Cut rectangular sections of balsa from the prescribed stock and cement in place. Once dry, remove the structure and carefully sand each rectangular piece of balsa to form a streamlined airfoil section.

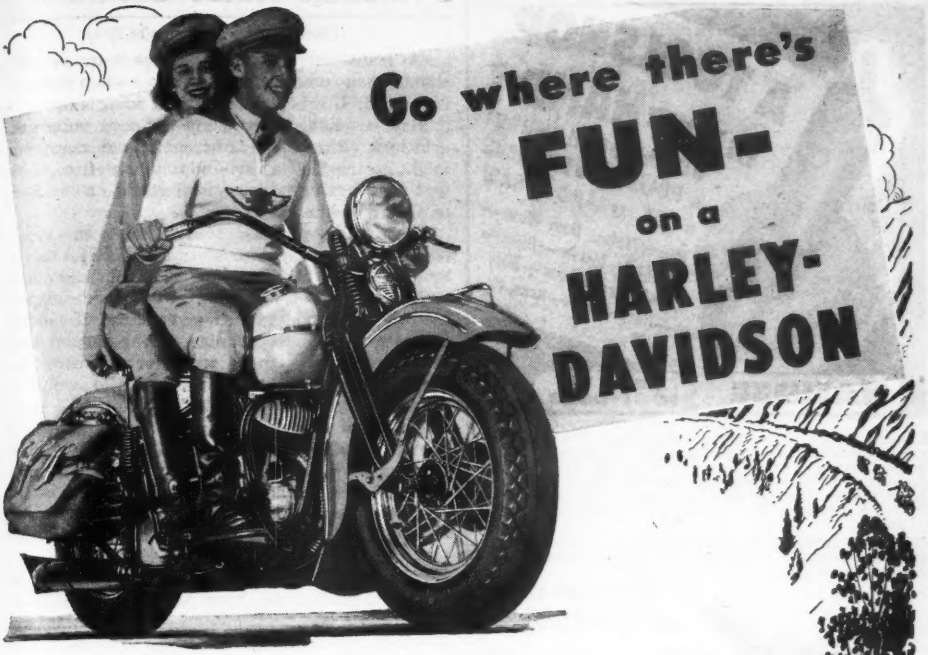
COVERING: A neat covering job is always the deciding factor if a model is to be considered "super" or just fair. Use Silkspan tissue and a 50-50 mixture of cement and dope as an adhesive. Cover the fin, stabilizer, wing and fuselage in that order. The sides of the tail surfaces can be covered with one piece of tissue but in the case of the wing and fuselage use separate pieces for each flat surface.

FLYING: Snootie should balance when supported 2 in. back from the wing leading edge. Add a little weight to the nose or tail if the balance is too far off and then try a few hand glides into tall grass. If the model shows any tendency to stall, add a sliver of sheet balsa under the trailing edge of the wing. If it dives, increase the incidence angle. Warp the rudder just a bit to get a slight circle to the right, or against the torque. If you can get satisfactory hand-glides from shoulder height, proceed with powered hops. Don't use full power on the first attempt—take it easy and the job will last longer. After you see your model with its nose always up in the air you'll realize why we named it Snootie!

Tool Degausser

[*Continued from page* 107]

coil off and give it additional rigidity. The last step is to make the base assembly according to the details given in the large drawing. Use felt or leather gaskets between the coil and the .050 brass sides. These are fastened in place with round head wood screws. The U-shaped clamp that holds the coil in place is attached to the block with short wood screws to avoid penetrating the coil and damaging the wire. With the terminal housing and switch in place, the leads are soldered to the electric cord, taped and tucked back in the box. A regular plug is attached to the end of the cord and the coil is ready for demagnetizing anything that can be passed through.



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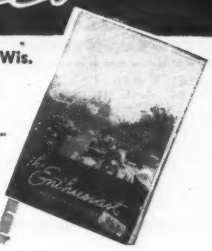

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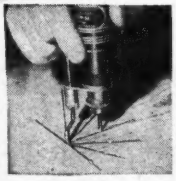

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Versatile Audio Oscillator

[*Continued from page* 113]

audio transformer. Do not reverse both. A tone should then come from the speaker when the key is pressed. If this tone is not just what is desired, it may be changed by using different values of grid leak (R2). Values of from 2 to 10 megohms might be tried. If a variable tone is desired, a ½ or 1 megohm variable resistor could be inserted as shown on the diagram as R3.

One refinement which was added to the audio oscillator at the amateur station of W1KLS was a modified key which is shown in Fig. 2. Any other amateur may well make use of this accessory for audible monitoring of his own sending. The extra contacts, which are installed on the regular key arm, operate the audio oscillator circuit while the regular contacts are used in the ordinary manner to key the transmitter circuit. The construction of various keys will be different of course, but this method as used on our key may be used as a guide. Experienced amateurs may prefer to use a relay for keying the audio oscillator and the transmitter at the same time but for the beginner this will afford an economical way to get double use from his key.

We believe that in presenting this oscillator to the radio builder we have provided a unit that will appeal to the beginner as well as to the amateur, for it offers advantages to both.

MATERIAL LIST

T1—3:1 ratio audio amplifying transformer (Stancor-A53)
T2—Universal output transformer (Stancor-A3856)
Speaker—3½" Permanent magnet type (Utah 3P)
C1, C2,—20-20 mfd. 150 volt electrolytic condenser (Aerovox Dandee)
C3—0.0002 mfd. mica condenser (Aerovox type 1467)
R1—5000 ohm, 2 watt carbon resistor
R2—6 megohm, ½ or 1 watt carbon resistor
R3—500,000 ohm or 1 megohm potentiometer (Centralab)
RL—360 ohm line cord resistor with plug
V1, V2,—Type 37, 76, 6C5, 6J5, etc. (Use tubes that draw the same filament current.)
SW—Line switch, S.P.S.T. toggle type
Key—Any type key that can be modified as shown

Smoker's Book Table

[*Continued from page* 117]

into place. To support the front of the shelf, holes should be drilled in the sides as shown on the drawing and flat-head wood screws used to fasten the pieces together. The front of the shelf is then planed to match the edges of the sides.

With the top of the table inverted, a cleat is screwed to the underneath side. Use flat-head screws through the sides and into the ends of the cleat to fasten the top and sides together.

After rounding all sharp edges and thoroughly sanding the surfaces, the table should be finished by staining and varnishing or by painting it to match other furniture.

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Handy Walkie

[*Continued from page* 124]

cases to the baseboard. Repeat on the opposite side. Next, nail the top frame together. The third step is to nail the top ends of the slats, which form the sides of the cart, to the top frame. Cut the slats to the correct length, before or after nailing. You can now nail the side slats, top and bottom. The surprising thing is that you have now completed the Handy-Walkie except for the wheels and handle. The wheels are the toughest part; they must be turned in the lathe from 8 in. squares of lumber. Before turning, fasten the two sections of each wheel together with the grain running at right angles, using screws and glue. Round off roughly on a bandsaw or jigsaw, and turn to size on the lathe's faceplate. Then drill a 1 in. hole in the center of each wheel for the axle. The handle is simple—just look at the drawing for details.

Screw or bolt the axles to the bottom of the cart, allowing sufficient projection to take care of the wheels and the pegs. Screw the "tailskid" to the side of the cart opposite the wheels for the final step. Be sure it is centered and arranged so the cart will be vertical when resting on it. A hole in the bottom serves as a drain. In the original cart, a knothole did the trick.—*Roland Cuzva*

Bike From A Trike

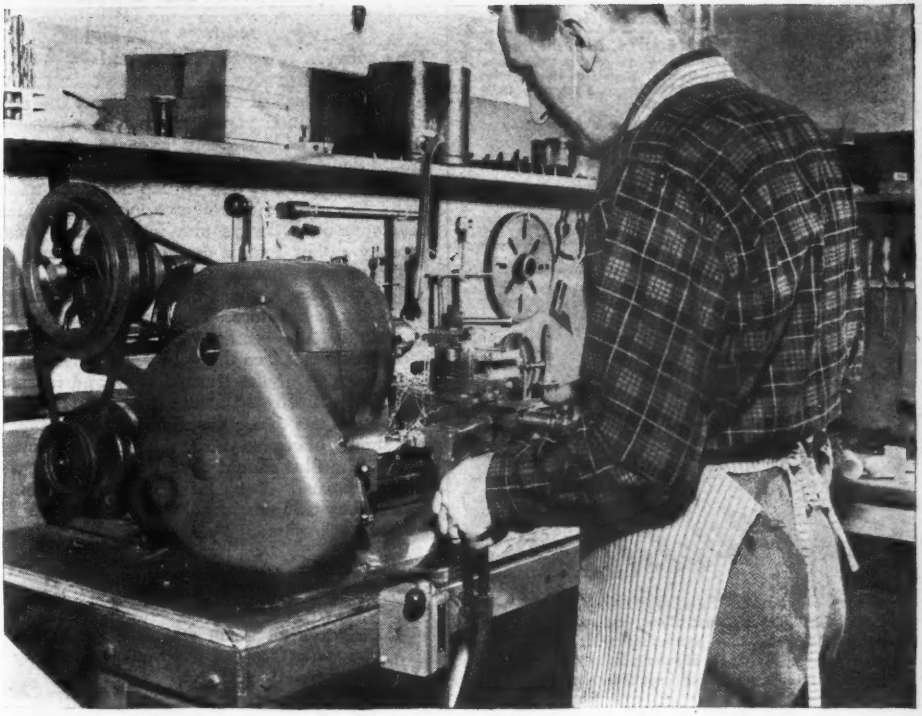
[*Continued from page* 127]

weld two iron washers, see the photo. Or, you can forge the ends out to take the axle bolt which would make the use of washers unnecessary. If washers are used they should be large enough to accommodate the axle bolt and should be spaced in line and held rigidly by using a pipe nipple as a spacer. *This alignment must be maintained during the welding process.* The fork is now ready and it should be welded to the cut-off end of the tricycle body.

The only remaining task is to mount the wheel in the fork. This is done by inserting a bolt through the washers and wheel and adjusting the tension on the washers until side play is eliminated and the wheel still turns freely. This adjustment can then be made permanent by splitting a nut and using it as a lock nut. It is important to have the wheel run true in the fork. It may be necessary to elongate the holes in the washers by filing until the desired position of the wheel is obtained.

If, after assembling, it is found that the front wheel does not caster properly and the bike is difficult to steer, the new fork may be bent as shown in the photo. This will lower the frame and give more slant or caster to the fork to make steering easier.

While this changeover requires the services of a welder, the job is a small one and the cost should be very little if the parts are properly prepared.



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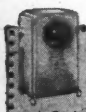

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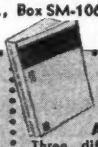

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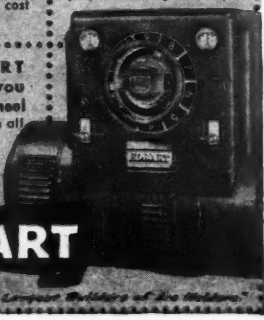

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Portraits In Gold

[*Continued from page* 135]

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Since the lantern slides have about the same speed as bromide paper, make a test exposure using paper. If properly exposed, the plates should develop from 1½ to 2½ minutes, at 65° F. It is very important that you do not block up the highlights, either by overexposure or forced development. Always aim for a "thin" transparency rather than a dense one. Fix and dry in the usual manner.

Now procure a sheet of "gold" paper at any stationery or art store. The paper should be free of wrinkles or creases. Cut the paper to the necessary size, place the gold surface against the emulsion side of the transparency and insert in a frame as illustrated at the top of page 135.

If you expect to use the photo as a pocket piece, you should of course use film instead of a lantern slide. The film should then be backed up with stiff cardboard. Many interesting effects can be obtained by using papers of other colors than gold for the background.

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2. **Transparencies or color prints of any type or size are eligible. If a color print is a prize winner, transparency must be available at request.**
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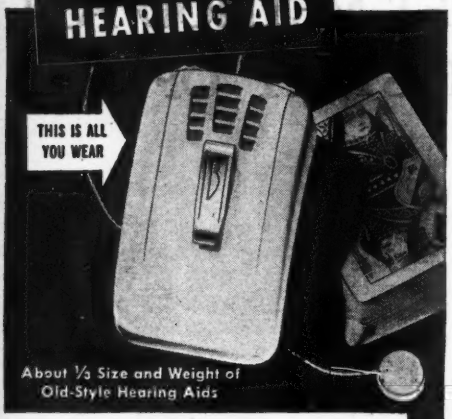

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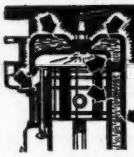

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Good Shooters, Safe Hunters

[*Continued from page* 51]

coordination of holding, breathing, sighting, and trigger squeeze.

First, the shooter lies prone at an angle of about 45 degrees to the target, legs outspread with heels in and toes pointed out. The elbows are rested on the ground to act as bipods for the rifle, which has been securely "tied" to the shooter by the sling. With the butt of the stock fitted into the "hollow" of the shoulder, to absorb recoil, the whole shooter becomes a virtual tripod for his rifle. Complete relaxation in this and other positions is vital. The only portion of the body under tension should be your trigger finger.

In the sitting position the shooter rests his elbows on his knees, depending for support only upon his left knee, upon which he rests his left elbow.

In the offhand or standing position the sling is not used, so correct balance is of utmost importance. The left hand should grasp the rifle at its center of balance. The feet should be a foot or more apart with the body turned to the right.

Shooters "squeeze" and never "pull" the trigger. The tip of the finger is never used as this induces jerking. The first or second joint of the finger should be used; I prefer the first because I believe it permits greater control. The trigger should be squeezed so slowly that the shooter does not know the precise instant it is to be released.

You should hold your breath when you squeeze the trigger, otherwise your breathing will lift your aim above or below the target.

Although the conventional layman's picture of a shooter shows him squinting with his left eye closed, good shooters keep both eyes open. If you hope to excel as a marksman, you should determine which is your "master" or stronger eye and make correction for the other. The "master" eye test is simple. Aim your finger at an object with both eyes open. Then alternately close each eye. The eye which still "points" the object is the master. The sighting eye of a right-hand shooter should be the right, and the left for the left-hand shooter. If the sighting eye is weaker and the front sight cannot be seen perfectly, it is advisable to have glasses fitted, if only for the weaker eye. Lenses intended for use in shooting should be "decentralized," or thrown off center.

The ten safety rules which beginning shooters must learn apply to competitive shooting at paper targets as they do to hunting. In the hunting field their observation requires more vigilance as the shooter is constantly on the move and there are dramatic distractions—which is a paramount reason why the novice should always receive competent instruction in the use of firearms before he starts on a hunting trip. Safety must become almost second nature before a person should attempt to go hunting.

Incidentally, a list of hunters are missing a good bet in not belonging to a gun club.

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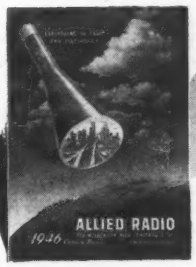

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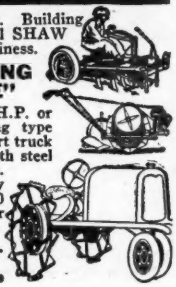

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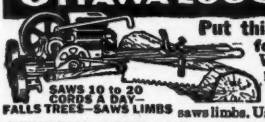

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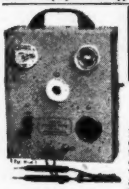

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Is Your New Car Safe?

[*Continued from page* 54]

Now, I have had my own share of gadget trouble in my own '46 though nothing serious. So when I heard this story I decided that as I was planning a coast-to-coast trip I would question every other new car owner I happened to meet in service stations, garages or other likely spots. In 17 different states, ranging from the Pacific to the Atlantic, I questioned 52 new owners of 11 entirely different makes of new cars and all but one had had some trouble or other.

In the one exception, the owner had driven his car only 800 miles. The troubles varied widely though I found five others beside my friend who had water pump trouble due to faulty bearings. Eleven had experienced generator trouble and eight had had fuel pump breakdowns. Two had starting motors go bad. One car had burned out a front wheel bearing in the first 100 miles because it had been assembled without grease.

One hydraulic master brake cylinder had cracked and another had a narrow escape when the tie-rod in the steering assembly had come off.

I am writing all this to warn you and to suggest how to avoid these pitfalls if you are lucky enough to get a new car. In the first place you won't feel very lucky if your new pride and joy falls apart just after the guarantee expires. As the president of one of the largest automotive supply companies said to me, the material that goes into the new cars is as good as ever but the plants seem to be putting them together with flour and water.

So, here are my suggestions:

Watch your car like a cat for the first 5,000 miles. If you get by this point trouble free you will have little if anything to worry about until the car wears out from old age. Put the car on a grease rack at least three times in the first 1,000 miles and either pay a mechanic or check all connections and fastenings yourself.

Make sure that all the bolts and connections are snug. Try all visible nuts for firmness. Above all, look for wet spots which might show oil or grease escaping under the pressure of running and be sure to keep grease points filled.

Next, with the hood up, let the engine run and watch the pulleys around the water pump for eccentric action. Also notice if the generator pulley is running true. Feel the generator for excessive heat and at the sign of any knock or tap take the car to the nearest service station for your make of car because it is responsible and you are not supposed to go exploring on your own hook.

Now, here is the most important part of all. Even if inconvenient, do your best to go on a long trip after your first 1,000 miles, or before your guarantee expires. A fast two or three day trip will bring out bugs that might lie dormant for another year if you just putter around the neighborhood. Select a route where you can keep the car going at speeds of 60 or more for several hours, because if there are any little gremlins there, this will chase them out.

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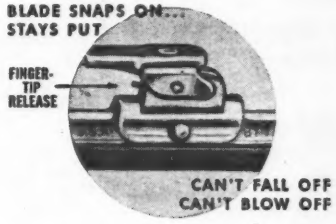

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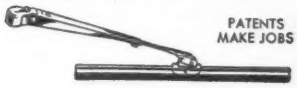

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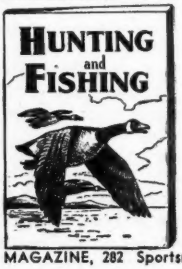

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Atomic Sub vs. Atomic Bomb

[*Continued from page* 59]

under water as well as at the surface. This is the only type of power plant known which can do both.

The uranium pile would be neither small nor light and heavy shielding would be required for the safety of the crew. But the storage batteries of a modern submarine alone weigh about 200,000 pounds and the electric generators and the big Diesel engines are by no means light. The whole atomic power plant, including shielding, might well weigh less in the end than the twin power plants of a conventional submarine of comparable size. Certainly, the atomic power plant would take up less space.

Once the submarine atomic power plant is installed there will be no limit to the cruising range.

Since more weight can be piled on a larger submarine, it could be built stronger throughout, possibly for routine diving to as much as 800 feet.

Such a submarine would then reach the dimensions and the carrying capacities of at least the cruiser, if not of the battleship. And with such changes diversification would be sure to set in and submarine aircraft carriers, troop carriers, supply ships and capital ships would be developed.

The all-around serviceable atomic-powered military submarine of the future will be conceived mainly as an under-water boat with a hull design permitting high submerged speed.

Armament might include a dozen torpedo tubes, three eight-inch guns in a main turret, six four-inch guns in two additional turrets, guided missile antiaircraft weapons, two helicopters for observation and odd jobs and a launcher for V-1-type robot bombs with atomic warheads. Long-range rockets would probably have to be installed on specialized ships.

If that "next" war should come, perhaps aircraft will not play the dominant part it did during the last war. Perhaps swift, silent undersea fleets will have blasted the enemy's strong points and landed men and supplies to hold them.

English Austin

[*Continued from page* 55]

does offer such features as 35 to 40 miles per gallon of gas and compact community transportation, but for the average American motorist who needs a car for work and play it is doubtful if the Austin would fill his bill. For one thing, it lacks the power we have become so used to. It has four speeds ahead but it lacks the punch of an American car when you get the green light or try to pick up speed on a hill. Its top speed is around 65, with a comfortable cruising speed somewhere between 40 and 50. It is hardly a car which an American driver would pick out for a trip from coast to coast

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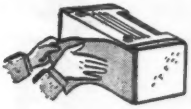

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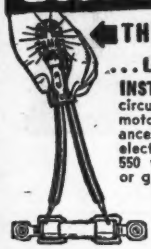

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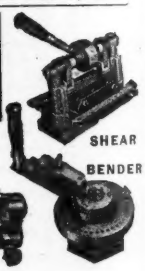

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Davy Jones' Choir

[*Continued from page* 65]

be heard far off over the water on still nights.

The "Dog's Tongue" or cynoglossus, just a four-incher of the sole family, is in the habit of attaching himself to the bottoms of boats and making a sound like a jew's harp struck slowly. Sometimes, when he's really in the groove, the sound increases in volume and resembles the tone of a small organ.

The sunfish gives vent to a distinct groan when it is removed from the water. The carp and barbel, also registering vocal objection to being hooked, utter staccato croaks.

The horse mackerel or scad produces a noise like the grunting of a hog, although on a slightly higher pitch. The meagre hums to himself as he wanders under water and when he gets together with a bunch of the boys they create a noise which can be heard through a depth of more than 120 feet.

The tub fish emits a sound very similar to the caw of a crow and the conger eel barks like a dog. The well-named oldwife prattles away with a chirp and a chatter.

Probably the noisiest of all is the grunt, who makes like his name in a loud, angry manner. A school of them holding a convention at the bottom of a vessel anchored on a quiet night in tropical waters can set up enough of a racket to keep an entire crew awake.

It was in the summer of 1942 that the war effort came smack up against these oceanic warblers. The submarine menace around the U. S. coast was at its height and undersea microphones were installed in coastal minefields to pick up the telltale signs of approaching enemy craft. The mikes, or hydraphones, were linked by cable to listening posts on shore, and the vigil began.

It wasn't long before the men at the receiving ends yelped exultantly. Noises were coming through, all kinds of noises. Speedily the Navy went into action and scoured the seas—but no submarines. The scientists puzzled, inspected their equipment carefully, found no flaw and tried again. Again the fearful noises, but again no submarines. They scratched their heads and called in the Navy. The Navy people looked blank and called Prof. Charles H. Blake, an eminent biologist from the Massachusetts Institute of Technology.

Prof. Blake listened a moment, then said curtly: "It's fish."

And fish it was—a couple of million croakers.

So the scientists fitted out a yacht with sound-detecting and sound-measuring equipment and went cruising up and down the Atlantic and into the Gulf of Mexico to find out more about fish noises and figure out a way how they could be differentiated from submarine or enemy surface craft sounds.

They catalogued dozens of different sounds—and soon a secret device was perfected by means of which they were able to tell a finny fish from a steel one.

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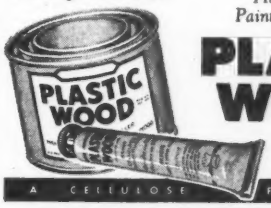

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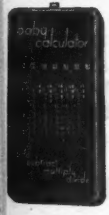

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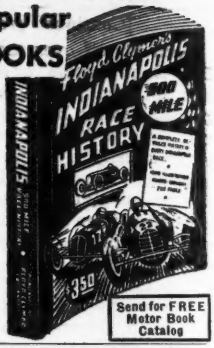

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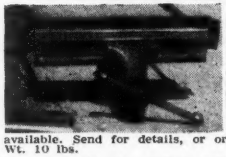

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High Speed Bail-Out

[*Continued from page* 66]

and luck get out in the air-flow, he'd be forced back against the tail and smashed to a pulp.

Inventive minds have been at work on this problem, however, and escape at high speeds is now possible. The solution uses three ingenious developments. The first brings the pilot clear of the plane and is called the Ejector Seat, at Wright Field, Ohio, where it was perfected.

The Ejector Seat, fitted into the cockpit of a high-speed plane, enables the pilot at the squeezing of a trigger to eject himself—seat, oxygen bottle, parachute and all—*fast*. It is mounted on a vertical track in the cockpit, and is actuated by a 37-mm. blank cannon shell. Down the center of this track runs the telescoping barrel of a cannon.

The powder charge propels a weight of 300 pounds to about 60 feet at about 45 mph. This means that for a moment after discharge the pilot experiences a stress of about 18.5 times his normal weight; the "firing weight" of a pilot weighing 200 pounds would be almost two tons!

Once clear of the plane the Ejector Seat automatically sets off another charge that releases the pilot's safety belt and opens a small parachute which pulls the seat away from him, permitting him to fall free with his own 'chute.

The falling pilot is equipped with the well-known "bail-out bottle" of compressed oxygen, which lets him live through the thin air of the stratosphere, but his safety requires getting back down to a livable altitude in a hurry. He must fall free, with unopened 'chute, till a safe height has been reached, and then in case of accident, uncertainty about his altitude, or unconsciousness, his parachute must open without his help, regardless of his condition.

This second requirement of successful high-speed escape has been met by the Aneroid Automatic Parachute Opener—another Wright Field development. This unique guardian is so designed that barometric pressure opens the 'chute. The unit is attached to the rip-cord. During the pilot's free fall a diaphragm in it expands with the increasing air pressure until a trigger, preset for a certain altitude, is touched off, firing a small blank cartridge, which effects the pulling of the rip-cord.

In this way the pilot will be brought to fall slowly through livable air—if he's using the Ribbon Parachute.

This new parachute is necessary. It is exactly what its name implies, a 'chute made of ribbons. After a high-speed fall an ordinary parachute might easily rip to shreds, but the ribbon 'chute does not rip. Its canopy is a lattice work of nylon ribbons, each about two inches wide. As it opens, the ribbons stretch, increasing the size of the interspaces and allowing excess air pressure to escape. As the falling speed decreases, pressure becomes less and the ribbons contract, closing the spaces and increasing the canopy's braking power.

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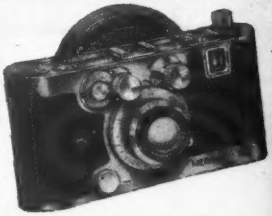

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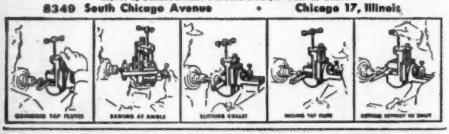

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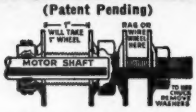

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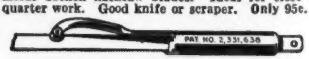

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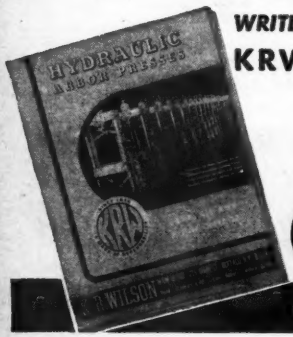

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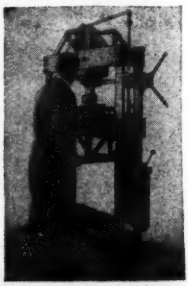

K. R. WILSON, DEPT. 53, 215 MAIN ST., BUFFALO 3, N. Y.

Plane-Auto

[*Continued from page* 67]

road, then start ahead at increasing speed, just as any automobile. Come to a nice straight stretch of road you'd extend your wings and take off—into the air. Just like that. Or (a few years before you'll be able to do *that*) you'll drive to the nearest airport and take off from there.

You'll drive, fly, land, then drive back to your garage.

You'll have a roadable plane.

Roadable planes have been headed this way for some time, and now, at last, they are just around the corner. Good ones, too, from the advance dope. Here's one called the "Plane-mobile."

The Plane-mobile has already been built (though improvements are still being made). It will take you 50 mph. or so along the roads in your neighborhood. It has a straight mechanical road drive (though a hydraulic drive, better and lighter, is ready for testing). It runs on three wheels, the front two steerable and sufficiently ahead of the center of gravity to avoid any nosing-over tendency when the three-wheel brakes are applied, the rear wheel supporting about a third of the weight and providing good traction. On the road the wings lie folded on top of the fuselage.

The wing folding can be accomplished by two men in about ten minutes, the only tools a wrench, hammer, and drift punch. While one man supports and folds the wings, the second disengages the wing fitting pins. Disconnection of the flight controls takes place automatically when the wings are folded. An improved version employs a simplified manual folding arrangement which requires only three minutes and one man.

When you spread the wings of this plane-auto and take to the air you'll find you're in an unusually safe plane. First, the takeoff will be exceptionally short, for you can use both the road drive and the propeller. If you use a variable pitch propeller your takeoff—and climb—will be shorter still. With the addition of flaps (which are coming) you'll be able to land in short order.

Lion Grows A Wing

[*Continued from page* 68]

mere speculation. "Ghost" jet engines produced by de Haviland of England will power it, according to reports. Major Frank Halford, de Haviland chairman, confidently predicts 85-ton ghost-powered planes flying from London to New York at a speed of 615 mph with the single fare running at $240 per head.

The great flying wing now nearing completion under wraps is expected to carry its 50 passengers seated in a center cabin. The four jet engines will deliver sufficient power in thrust to shuttle it back and forth between the continents on an over-and-back-in-a-day schedule which will give the American big ship operators something to really worry about.

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Wild-Life Miniaturist

[*Continued from page* 85]

tiny fish swimming below the surface of the celluloid water.

In another group, black-and-white-striped zebras rear in a frenzy to escape the charge of ferocious lions springing from bushes. The zebras and lions are only about an inch long. Leopards stalk their prey, giraffes two inches tall amble over the African veldt, and wild turkeys spread their tails in an American wood-lot. They're as real as can be, only minute.

Most popular of Dr. Childs' miniatures are those in the game bird series. These show the male and female birds and sometimes their young, all grouped in their natural surroundings. Sportsmen and nature lovers are taking this series faster than Dr. Childs can supply them.

The creator of these wonderful miniatures has his own philosophy about them. He feels that they serve as a kind of lesson in wild life conservation, that they may become a valuable record of birds and animals rapidly being wiped out, and that they are a great personal pleasure to him because of the enjoyment they give to others who view them.

Certainly a hunter or fisherman or nature lover would get a kick out of reconstructing in miniature his favorite mountain ridge complete with deer, or his pet fishing hole or nature trail. Such an activity would provide him with vicarious hunting, fishing or hiking thrills until the time when warm weather comes around and affords him the real thing again.

Art On Metal

[*Continued from page* 90]

metallurgical engineers, visiting steel plants and experimenting with the trial and error method, she developed a method of working on bright metals that will make her paintings endure well over a thousand years.

The root of the problem lay in getting the paint to adhere to the smooth surface of metals. The solution has been to use a set of diamond-pointed tools in various shapes and sizes for undercutting the surface so that the paint, when applied, is literally hooked to the metal. Large areas of the metal are left smooth and glistening to give what Mrs. Mullen describes as "a more vitally alive contrast with the paint."

A native of Chicago, Mrs. Mullen has a studio in New York where most of the portraits and murals in metal are done. Her metal murals are in the Library of Congress, the Naval Academy at Annapolis and other government buildings. Her largest mural, to date, measuring fifteen by twenty feet, was made on steel for a South American government.

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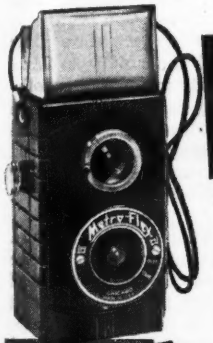

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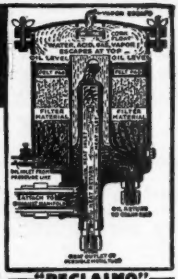

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A Look At Your Nerves

[*Continued from page 89*]

flash a message to the spine; motor nerves bounce back the message to kick your lower leg. Another reflex you can demonstrate in yourself is that of the eye pupils. Flashlight in hand, stand in front of a partly darkened mirror and turn the light into your eyes. In about three-fourths of a second the pupils will contract. This is the time required for the light stimulus to travel from eye to brain to a stimulated motor cell and for orders to reach the delicate muscles that contract the pupil. All without conscious thought—a true reflex.

Reflexes are important in diagnosing diseases involving the nervous system. Failure of pupils to contract, or knees to jerk, and the like, give the neurologist important clues to the site of trouble. On the other hand, an ordinary case of "nerves" or a nervous breakdown does not mean that there is physical disorder of the nerves. They are quite intact. Trouble is such cases arises from conflicting or frustrated impulses of mental origin that jam the communication pathways in a way comparable to the jamming of radar signals.

However, changes do occur in your nerves and if you are older than ten years they have already begun to age. Between the ages of twenty and thirty the reactive capacity of your nerves diminishes considerably: prize-fighters are old at thirty; their brains may send the message but legs don't respond as they used to. After the age of forty, signs of nerve-aging can be demonstrated by the pathologist. It is a consolation that nerve pathways constantly used do not lose their capacities so swiftly. And the ability to learn (conceived of as the capacity to form new pathways of association between nerves) is not a sole attribute of youth. Some authorities hold that the ability to form new connections never ceases, and it is now well established that the man of forty or fifty learns new tricks about as well as the man of twenty.

To be sure, a young man has faster reflexes. Fighter plane pilots are typically young, and the best motor car drivers would be persons of eighteen or twenty except for the fact that judgment, involving nerve associations more complex than reflexes, is a more important part of the picture.

Just what, exactly, *is* a nerve impulse? The answer is incomplete but much is known or surmised. A nerve impulse is not an electric current, although it dissipates energy as electricity that can be detected by a "brain wave" recorder. Electrodes placed against your skull, connected to an amplifier, register rhythmic changes of electric potential accompanying the activity of cortical brain cells, and a skilled interpreter can surmise, from looking at the recorded graph, whether you were asleep or worried or perhaps suffering from epilepsy.

One thing is quite clear. We all have vastly greater mental capacities than we make use of.

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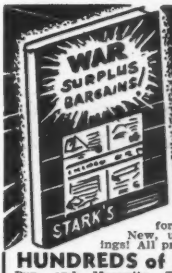

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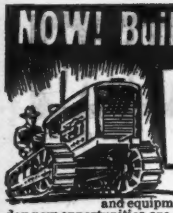

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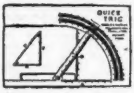

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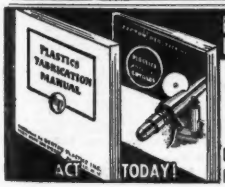

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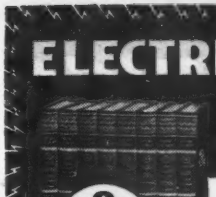

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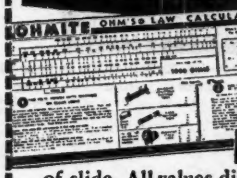

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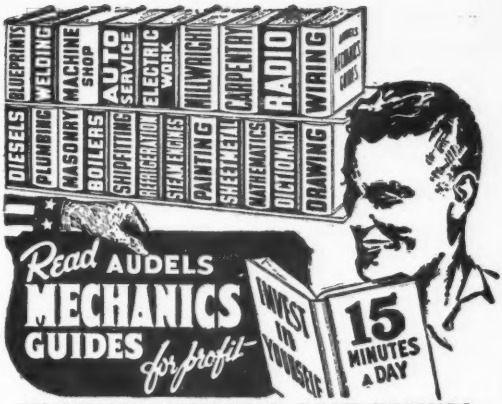

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